



FIFTEENTH ANNUAL REPORT
(OF THE)
WATER COMMISSIONER



FOR THE YEAR ENDING
JANUARY 31, 1910

FIFTEENTH ANNUAL REPORT

OF THE

WATER COMMISSIONER

FOR THE

YEAR ENDING JANUARY 31, 1910

Printed for the Department



CITY OF BOSTON
PRINTING DEPARTMENT
1910

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cont.

Boston Water Commissioners
Dec. 15. 1911

1899-10


1899-10

1899-10

1899-10

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FIFTEENTH ANNUAL REPORT

OF THE

WATER DEPARTMENT

FOR THE YEAR 1909-10.

OFFICE OF THE WATER COMMISSIONER,
CITY HALL, BOSTON, February 7, 1910.

HON. JOHN F. FITZGERALD,
Mayor of the City of Boston:

SIR,— I submit herewith the fifteenth annual report of the doings of the Water Department covering the year ending January 31, 1910.

The receipts and disbursements of the department for the year were as follows:

Total receipts from all sources	\$2,897,635 48
Total expenditures for all purposes	<u>\$2,897,635 48</u>

TOTAL RECEIPTS OF THE YEAR BY SOURCES.

Sales of water	\$2,609,102 39
Service, elevator, fire and motor pipes and repairs, labor, materials, etc.	56,155 02
Sale of old materials	4,858 25
Fees for summonses	2,904 52
Shutting off and letting on water on account of repairs	1,994 00
Shutting off and letting on water on account of nonpayment of bills	1,468 00
Use of West Roxbury pumping plant	794 82
Difference on cost of laying main pipe	359 00
Board of City Engineer's horse	312 00
<i>Carried forward</i>	<u>\$2,677,948 00</u>

<i>Brought forward</i>	\$2,677,948 00
Interest on deposits	296 50
Sale of merchandise	282 49
Sale of horses	275 00
Conscience money	155 00
Rents	100 00
Sale of hay	15 00
	<hr/>
	\$2,679,071 99
Credited from taxes	159,000 00
Transfer by City Auditor	59,563 49
	<hr/>
	<u>\$2,897,635 48</u>

EXPENDITURES.

Current expenses and extensions	\$871,367 43
Metropolitan water assessment	1,862,823 42
Interest on funded debt	161,963 39
Refunded water rates	1,481 24
	<hr/>
	<u>\$2,897,635 48</u>

Details of expenditures under the appropriation for current expenses, etc., for the fiscal year ending January 31, 1910. (From revenue.)

Salaries and wages:		
William E. Hannan, commissioner	\$5,000 00	
Isaac Rosnosky, assistant commissioner to February 12, 1909	350 00	
Walter E. Swan, chief clerk	3,000 00	
Employees	481,627 12	
	<hr/>	\$489,977 12
Water pipes and other castings		128,460 33
Meters:		
New meters	\$65,014 25	
Repairs and extra parts	2,360 56	
	<hr/>	67,374 81
Blasting and excavating pipe trenches and laying and relaying water pipes		57,460 91
Stable:		
Board, feed, etc.	\$10,618 67	
Vehicles and repairs	3,651 32	
Horseshoeing	2,538 11	
Horses, purchase of	1,510 00	
Harnesses and repairs, etc.	1,359 30	
Veterinary services, etc.	626 75	
	<hr/>	20,304 15
Repairs and alterations of buildings, repairs of streets and structures		19,305 57
Tools and machinery and repairs of same, iron, steel, hard- ware and small supplies		16,504 96
Lead and lead pipe		14,556 15
Lumber		11,348 35
Automobiles:		
Two emergency cars, \$2,000 each	\$4,000 00	
One Corbin runabout	1,400 00	
Repairs, supplies and care	4,551 66	
	<hr/>	9,951 66
<i>Carried forward</i>		<hr/>
		\$845,244 01

WATER DEPARTMENT.

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<i>Brought forward</i>		\$845,244 01
Printing		4,527 03
Traveling expenses and transportation of employees		3,792 76
Fuel		2,388 11
Gravel and crushed stone		1,920 40
Teaming, freight and expressage		1,899 09
Telephones		1,813 14
Salt		1,705 00
Stationery, etc.		1,554 89
Rents		1,252 00
Cement, lime and sand		787 92
Drinking fountains		769 32
Oils		670 33
Postage		419 69
Brick		368 15
Insurance		340 00
Gas		309 77
Taxes		299 25
Furniture		290 07
Electric lighting		281 50
Advertising		220 94
Waterproof clothing		213 91
Salt hay		135 34
Professional and expert services		50 00
Drain pipe		47 00
Ice		37 43
Recording papers		25 40
Premium on surety bonds		25 00
		<hr/>
		\$861,387 45
Damages	\$7,979 98	
Payment to widow of employee killed (chapter 141, Acts of 1909)	2,000 00	
	<hr/>	9,979 98
		<hr/>
		<u>\$871,367 43</u>

There was also expended by the Water Department, under an appropriation of \$5,000 from the Reserve Fund, for ice for drinking fountains (order of City Council, approved May 26, 1909):

Ice	\$3,592 63
Advertising	12 10
	<hr/>
	<u>\$3,604 73</u>

For comparative table of receipts and expenditures, condition of water debt, etc., see statements annexed.

Reports of work performed in the Income and Distribution Divisions and the Engineering Department will be found in the appendices annexed hereto.

Respectfully,

WILLIAM E. HANNAN,
Water Commissioner.

Comparative Table of Receipts and Expenditures.

Receipts.

	1905-06.	1906-07.	1907-08.	1908-09.	1909-10.
Sales of water.....	\$2,400,764 31	\$2,471,726 19	\$2,558,614 34	\$2,626,564 59	\$2,609,102 39
Other receipts.....	58,315 50	80,118 91	67,975 43	52,509 31	69,969 60
	\$2,459,079 81	\$2,551,845 10	\$2,626,589 77	\$2,679,073 90	\$2,679,071 99
Loan, extension of mains.....	330,000 00	300,000 00			
Credited from taxes.....	200,000 00	120,000 00			159,000 00
Transfers by City Auditor.....			35,878 85	16,687 10	59,563 49
	\$2,989,079 81	\$2,971,845 10	\$2,662,468 62	\$2,695,761 00	\$2,897,635 48
Balance beginning of year.....	* \$23,727 34	{ * \$17,540 97 † 9,460 67 \$27,001 64	{ * \$16,365 90 † 54,739 39 \$71,105 29		
Balance end of year.....	{ * \$17,540 97 † 9,460 67 \$27,001 64	{ * \$16,365 90 † 54,739 39 \$71,105 29			

Expenditures.

	1905-06.	1906-07.	1907-08.	1908-09.	1909-10.
Current expenses.....	\$541,375 59	\$544,769 54	\$646,191 07	† \$729,677 14	† \$871,367 43
Metropolitan water assessment.....	1,758,635 00	1,822,556 33	1,726,588 68	1,789,315 84	1,862,823 42
Interest.....	348,188 36	257,764 85	178,217 66	175,010 17	161,963 39
Refunded water rates.....	1,420 19	1,475 66	1,210 60	1,757 85	1,481 24
Extension of mains:					
From loans.....	336,186 37	301,175 07	16,365 90		
From appropriation from revenue,			165,000 00		
	\$2,985,805 51	\$2,927,741 45	\$2,733,573 91	\$2,695,761 00	\$2,897,635 48

* Loan.

† Taxes.

‡ Amount expended for current expenses and extensions, there being one appropriation only.

COST OF BOSTON WATERWORKS.

Cochituate supply	\$1,715,950 73
Sudbury supply	9,267,367 04
Mystic supply	1,806,316 72
Distribution system	15,196,885 49
Total cost, January 1, 1898	\$27,986,519 98
Cost of portion taken by the state	14,717,009 30
Cost of portion remaining	<u>\$13,269,510 68</u>
Cost of portion taken by the state	\$14,717,009 30
Total payments by state	13,685,766 84
Excess of cost over amount paid	<u>\$1,031,242 46</u>

Cost in detail of portion of original works, exclusive of state taking:

Brookline Reservoir	\$200,077 21
Beacon Hill Reservoir	363,533 21
South Boston Reservoir	90,908 10
Jamaica Pond Aqueduct	88,417 20
East Boston Reservoir	66,103 09
Parker Hill Reservoir	205,793 81
Fisher Hill Reservoir	191,135 35
Roxbury high service	103,829 53
Brighton high service	7,745 00
East Boston high service	30,208 12
West Roxbury high service	22,346 56
Pipe yards and buildings	94,832 16
Engineering expenses	57,873 58
Distribution	10,871,844 18
Cochituate works	\$12,394,647 10
Mystic works (distribution)	874,863 58
Cost, January 31, 1898	<u>\$13,269,510 68</u>
Carried forward	\$13,269,510 68

Brought forward \$13,269,510 68

Additions to cost on account of extension of mains, etc. (eleven years to January 31, 1909), viz.:

Year ending January 31, 1899	\$411,910 26
" " 31, 1900	446,120 35
" " 31, 1901	364,604 06
" " 31, 1902	259,228 99
" " 31, 1903	125,705 99
" " 31, 1904	117,501 25
" " 31, 1905	221,595 49
" " 31, 1906	313,465 41
" " 31, 1907	293,734 68
" " 31, 1908	220,239 57
" " 31, 1909	182,602 70
	<u>2,956,708 75</u>

Cost represented on waterworks ledger January 31, 1900,	\$17,257,461 89
Cost represented by above statement on same date	<u>16,226,219 43</u>

Excess of cost represented over amount paid by state, \$1,031,242 46

The following is a statement of the cost of the existing works on January 31, 1910:

East Boston Reservoir	\$66,103 09
Parker Hill Reservoir	205,793 81
Fisher Hill Reservoir	191,135 35
East Boston high service	24,173 26
West Roxbury high service	22,346 56
Pipe yards and buildings	94,832 16
Engineering expenses	57,873 58
Distribution (additions during the year, \$203,369.28)	14,931,685 79
Total	<u>\$15,593,943 60</u>



COST OF CONSTRUCTION AND CONDITION OF THE WATER DEBT.

Cost of construction of waterworks to February 1, 1909,*	\$15,390,574 32
Cost of construction of waterworks to February 1, 1910 .	15,593,943 60
Increase during the year	<u>\$203,369 28</u>
The outstanding water loans February 1, 1909, were .	\$4,249,500 00
The outstanding water loans February 1, 1910, were .	3,696,500 00
Decrease during the year	<u>\$553,000 00</u>
The Water Sinking Fund February 1, 1909, was . .	\$3,637,956 71
The Water Sinking Fund February 1, 1910, was . .	3,205,159 65
Decrease during the year	<u>\$432,797 06</u>
Net water debt February 1, 1909	\$611,543 29
Net water debt February 1, 1910	491,340 35
Decrease during the year	<u>\$120,202 94</u>
Stock on hand February 1, 1909	\$129,578 98
Stock on hand February 1, 1910	137,876 08
Increase during the year	<u>\$8,297 10</u>

The outstanding water loans on February 1, 1910, were as follows:

Loans.	Date of Maturity.	Amount.
4 per cent loan, due April,	1910	\$135,000 00
4 " " " April,	1912	324,000 00
4 " " " October,	1913	50,000 00
4 " " " January,	1914	459,000 00
4 " " " April,	1914	9,500 00
4 " " " October,	1914	10,000 00
4 " " " April,	1915	32,700 00
4 " " " October,	1915	17,000 00
4 " " " January,	1916	8,000 00
4 " " " April,	1916	18,500 00
4 " " " October,	1916	11,300 00
4 " " " January,	1917	8,000 00
3½ " " " April,	1917	275,000 00
4 " " " April,	1917	6,000 00
4 " " " October,	1917	128,700 00
4 " " " January,	1918	13,000 00
4 " " " April,	1918	300 00
3½ " " " July,	1918	100,000 00
Carried forward		<u>\$1,606,000 00</u>

* See revised statement of cost of works in last annual report.

Loans.		Date of				Maturity.		Amount.	
<i>Brought forward.</i>								\$1,606,000 00	
1	per cent loan, due	October,	1918	.	.	.	.	.	95,000 00
4	"	"	April, 1919	.	.	.	.	.	200,000 00
3½	"	"	October, 1919	.	.	.	.	.	2,000 00
4	"	"	October, 1919	.	.	.	.	.	164,000 00
3½	"	"	November, 1919	.	.	.	.	.	106,000 00
3½	"	"	January, 1920	.	.	.	.	.	70,000 00
4	"	"	October, 1920	.	.	.	.	.	163,500 00
4	"	"	April, 1921	.	.	.	.	.	100,000 00
4	"	"	October, 1921	.	.	.	.	.	140,500 00
4	"	"	January, 1922	.	.	.	.	.	40,000 00
4	"	"	April, 1922	.	.	.	.	.	75,000 00
4	"	"	October, 1922	.	.	.	.	.	193,000 00
4	"	"	October, 1923	.	.	.	.	.	18,275 00
4	"	"	October, 1924	.	.	.	.	.	436,225 00
3½	"	"	July, 1929	.	.	.	.	.	287,000 00
Total									<u>\$3,696,500 00</u>

SUMMARY.

$3\frac{1}{2}$	per cent loans	. . . . .	\$840,000 00
4	"	. . . . .	<u>2,856,500 00</u>
Total			<u>\$3,696,500 00</u>

COCHITUATE WATER SINKING FUND RECEIPTS.

[Since the Establishment of the Board of Sinking Fund Commissioners in 1871.]

WATER DEPARTMENT.

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YEAR.	From Tax Levy of City Income.	Interest on Investments.	Interest on Bank Deposits.	Water Rates, etc.	Premiums on Loans.	Other Sources.	Totals.
1871, April 30, received from Committee on Reduction of Debt.....	\$1,100,000 00						\$1,100,000 00
1871-72.....	Taxes, 14,325 00 9,375 00	\$61,000 00	\$349 67				85,049 67
1872-73.....	9,000 00	70,137 50	1,017 80				80,155 30
1873-74.....	30,090 00	76,799 60	2,072 65				108,962 25
1874-75.....	75,973 28	82,842 25	2,121 13				160,936 66
1875-76.....	65,554 00	85,470 00	3,617 55			\$386 00	155,027 55
1876-77.....	234,814 00	86,245 66	4,119 47	\$26,480 18		915 46	352,574 77
1877-78.....	Taxes, 214,500 00	85,830 85	10,809 31	27,099 92			338,240 08
1878-79.....	Taxes, 207,456 00	93,264 49	6,181 26	177,195 91		9,874 21	493,971 87
1879-80.....		90,472 42	5,687 62	214,707 24		4,411 64	315,278 92
1880-81.....		86,460 00	167 32	195,688 90		1,762 04	284,058 26
1881-82.....		96,546 35	2,767 90	193,840 36		494 08	293,648 69
1882-83.....		105,129 51	8,486 33	216,581 72		1,241 04	331,438 60
1883-84.....	Taxes, 973 00	138,120 90	2,268 22				141,362 12
1884-85.....		143,049 45	7,510 40	209,258 39			359,818 24
1885-86.....		156,694 01	5,804 31	120,129 12		442 27	283,069 71
1886-87.....	Taxes, 75,496 00	181,264 89	2,644 70	297,928 95		5,081 12	562,415 66
1887-88.....		199,883 90	4,178 16	221,620 11			425,682 17
1888-89.....		213,048 22	8,958 69	256,013 57			489,572 98
1889-90.....		228,000 83	11,730 60	300,903 00			576,726 93
Amount carried forward.....	\$2,037,556 28	\$2,280,260 83	\$90,493 09	\$2,457,427 37	\$47,645 00	\$24,607 86	\$6,937,990 43

COCHITUATE WATER SINKING FUND RECEIPTS.—Concluded.

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CITY DOCUMENT No. 40.

YEAR.	From Tax Levy of City Income.	Interest on Investments.	Interest on Bank Deposits.	Water Rates, etc.	Premiums on Loans.	Other Sources.	Totals.
<i>Amount brought forward</i>	\$2,037,556 28	\$2,280,260 83	\$90,493 09	\$2,457,427 37	\$47,645 00	\$24,607 86	\$6,937,990 43
1890-91.....	229,509 17	29,763 94	242,675 22	36,530 00	.....	538,478 33
1891-92.....	175,808 33	22,560 16	275,014 05	.....	78,865 00	532,247 54
1892-93.....	260,506 20	30,148 34	240,435 00	16,413 50	.....	547,503 04
1893-94.....	298,224 44	18,133 03	299,467 27	14,621 75	.....	630,446 49
1894-95.....	312,332 05	18,524 22	297,518 29	.....	9,894 12	638,268 68
1895-96.....	378,819 55	5,892 29	205,791 00	64,690 00	.....	655,192 84
1896-97.....	403,840 02	2,225 08	194,740 00	.....	616 50	604,421 60
1897-98.....	421,928 45	8,337 21	193,395 00	8,833 50	15,877 86	648,372 02
1898-99.....	417,142 02	5,806 85	193,395 00	.....	8,016 00	624,359 87
1899-1900.....	383,662 97	7,632 45	209,824 00	29,835 70	2,148 90	633,104 02
1900-1901.....	397,985 35	15,948 83	206,489 00	.....	.....	620,423 18
1901-1902.....	325,030 96	31,199 25	.....	.....	* 609,000 00	965,230 21
1902-1903.....	313,707 65	37,297 28	.....	.....	.....	351,004 93
1903-1904.....	149,255 27	8,318 82	.....	.....	282 10	157,856 19
1904-1905.....	260,239 40	5,547 25	.....	.....	.....	265,786 65
1905-1906.....	242,176 39	13,015 36	.....	.....	.....	255,191 75
1906-1907.....	171,618 65	16,038 95	.....	.....	.....	187,657 60
1907-1908.....	126,325 04	2,064 84	.....	.....	.....	128,389 88
1908-1909.....	126,812 87	2,130 23	.....	.....	.....	128,943 10
1909-1910.....	84,114 47	2,008 09	.....	.....	1,382 00	87,504 56
	\$2,037,556 28	\$7,759,300 08	\$376,085 56	\$5,016,171 20	\$218,569 45	\$750,690 34	\$16,138,372 91

* Waterworks Fund.

WATER DEPARTMENT.

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Cochituate Water Debt, Gross and Net.

At the Close of each Fiscal Year.

FISCAL YEAR.	Gross Debt.	Sinking Funds.	Net Debt.
1847-48.....	\$2,129,056 32		\$2,129,056 32
1848-49.....	3,787,328 98		3,787,328 98
1849-50.....	4,463,205 56		4,463,205 56
1850-51.....	4,955,613 51		4,955,613 51
1851-52.....	5,209,223 26		5,209,223 26
1852-53.....	5,972,976 11		5,972,976 11
1853-54.....	5,432,261 11		5,432,261 11
1854-55.....	5,403,961 11		5,403,961 11
1855-56.....	5,230,961 11		5,230,961 11
1856-57.....	5,031,961 11		5,031,961 11
1857-58.....	4,724,961 11		4,724,961 11
1858-59.....	4,754,461 11		4,754,461 11
1859-60.....	3,846,211 11		3,846,211 11
1860-61.....	3,455,211 11		3,455,211 11
1861-62.....	3,012,711 11		3,012,711 11
1862-63.....	2,992,711 11		2,992,711 11
1863-64.....	2,992,711 11		2,992,711 11
1864-65.....	2,942,711 11		2,942,711 11
1865-66.....	3,152,711 11		3,152,711 11
1866-67.....	3,370,711 11		3,370,711 11
1867-68.....	3,867,711 11		3,867,711 11
1868-69.....	5,107,711 11		5,107,711 11
1869-70.....	5,731,711 11		5,731,711 11
1870-71.....	6,482,711 11	\$1,100,000 00	5,382,711 11
1871-72.....	6,812,711 11	1,185,049 67	5,627,661 44
1872-73.....	6,912,711 11	1,268,234 97	5,644,476 14
1873-74.....	7,863,711 11	1,372,952 62	6,490,757 49
1874-75.....	8,123,711 11	1,533,890 28	6,589,820 83
1875-76.....	9,735,711 11	1,560,917 83	8,174,793 28
1876-77.....	11,548,711 11	1,709,492 60	9,839,218 51
1877-78.....	11,545,273 98	2,043,764 73	9,501,509 25
1878-79.....	11,753,273 98	2,143,847 85	9,609,426 13
1879-80.....	11,697,273 98	1,771,692 92	9,925,581 06
1880-81.....	11,631,273 98	1,989,300 88	9,641,973 10
1881-82.....	11,631,273 98	2,281,857 89	9,349,416 09
1882-83.....	11,955,273 98	2,607,768 46	9,347,505 52
1883-84.....	12,882,273 98	2,746,505 58	10,135,768 40
1884-85.....	13,045,473 98	3,106,323 82	9,939,150 16
1885-86.....	13,491,473 98	3,385,201 26	10,106,272 72
1886-87.....	14,142,273 98	3,947,616 92	10,194,657 06
1887-88.....	14,741,273 98	4,373,304 09	10,367,969 89
1888-89.....	14,941,273 98	4,864,092 54	10,077,181 44
1889-90.....	15,696,273 98	5,440,819 47	10,255,454 51
1890-91.....	16,267,773 98	5,979,297 80	10,288,476 18
1891-92.....	16,423,773 98	6,471,545 34	9,952,228 64
1892-93.....	16,758,773 98	7,019,058 38	9,739,715 60
1893-94.....	17,055,273 98	7,649,504 87	9,405,769 11
1894-95.....	17,761,273 98	8,444,773 55	9,316,500 43
1895-96.....	18,261,273 98	9,099,966 39	9,161,307 59
1896-97.....	18,261,273 98	9,704,387 99	8,556,885 99
1897-98.....	17,911,273 98	9,852,760 01	8,058,513 97
1898-99.....	17,121,273 98	9,487,119 88	7,634,154 10
1899-1900.....	17,306,273 98	9,870,223 90	7,436,050 08
1900-1901.....	11,960,273 98	10,144,647 08	1,815,626 90
1901-1902.....	11,351,917 28	10,422,449 77	929,467 51
1902-1903.....	9,501,000 00	8,893,615 94	607,384 06
1903-1904.....	8,227,000 00	7,337,902 79	889,097 21
1904-1905.....	8,224,000 00	7,600,689 44	623,310 56
1905-1906.....	6,671,250 00	5,943,222 39	728,027 61
1906-1907.....	4,562,500 00	3,697,913 53	864,586 47
1907-1908.....	4,531,500 00	3,794,779 37	736,720 63
1908-1909.....	4,249,500 00	3,637,956 71	611,543 29
1909-1910.....	3,696,500 00	3,205,159 65	491,340 35

¹No account taken of amounts borrowed temporarily from 1846 to 1852 and afterwards funded by the issue of water bonds that figure in this statement.

**CONTRACTS MADE AND PENDING DURING YEAR COMMENCING FEBRUARY 1, 1909, AND ENDING
JANUARY 31, 1910.**

MISCELLANEOUS CONTRACTS.

Contracts marked thus () are completed.*

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT.	WORK.	PRICE OR AMOUNT.	PAID ON CONTRACT.		
					Previous Year.	Year 1909-10.	Total.
1908. * Feb. 25,	J. H. McCafferty Co..	Lowest bid in competition; advertised.	Composition castings for year end- ing January 31, 1909. Estimated quantities: 6,000 pounds No. 1..... 30,000 " No. 2..... 4,000 " No. 3.....	..... 22 cents per pound. 19½ " " 15 " "	\$6,113 32	\$1,213 26	\$7,326 58
* Feb. 25,	Charles Duncan & Son,	Lowest bid in competition; advertised.	Teaming water pipes, etc., for year ending January 31, 1909.	82 cents per ton 2,000 pounds, within 2½ miles from pipe yard. \$1.42 per ton 2,000 pounds, over 2½ miles from pipe yard.	1,326 02	125 76	1,451 78
* Feb. 28,	Mechanics' Iron Foundry Company.	Lowest bid in competition; advertised.	Iron castings for year ending Jan- uary 31, 1909. Estimated quantities: 800,000 pounds No. 1..... 140,000 " No. 2.....	..... \$2.85 cents per pound. 2.25 " "	15,801 90	5,437 07	21,238 97
* Aug. 6,	Camden Iron Works...	Lowest of three bids in compe- tition; adver- tised.	Cast-iron water pipes and special castings delivered at yard, 710 Albany street. Estimated quantities: 5 tons 4-inch pipe, B. 70 " 6-inch " " 170 " 8-inch " " 300 " 10-inch " " 460 " 12-inch " " 280 " 16-inch " " 10 " 24-inch " " 410 " 48-inch " 1A..... 25 " special castings.....	..... \$22.45 per ton 2,000 pounds.... \$22.30 per ton 2,000 pounds. 50.00 " "	39,145 50	6,955 43	46,101 02

* Nov. 23, 1909.	Eastern Salt Company,	Lower of two bids in competition; not advertised.	Salt for use on hydrants, etc., during winter season of 1908-09.	60 cents per sack delivered at the several divisions.	1,350 60	15 00	1,365 60
* Feb. 26,	Florence Iron Works...	Lowest of four bids in competition; advertised.	Cast-iron water pipes and special castings delivered at yard, 710 Albany street. Estimated quantities: 5 tons 3-inch pipe, B. 5 " 4-inch " " 60 " 6-inch " " 375 " 8-inch " " 140 " 10-inch " " 700 " 12-inch " " 100 " 16-inch " " 100 " 24-inch " " 1,225 " 30-inch " " 25 " special castings.....	\$23.30 per ton 2,000 pounds....	71,453 25		71,453 25
Feb. 26,	J. H. McCafferty Co. .	Next to lowest of four bids in competition; advertised. Lowest bid that of Foxboro Foundry Company at 20c., 19c., 18c., respectively; cost of inspection at that foundry would have made cost more.	Composition castings for year ending January 31, 1910. Estimated quantities: 9,000 pounds No. 1..... 20,000 " No. 2..... 4,000 " No. 3.....	21½ cents per pound. 19 " " 18 " "	9,127 80		9,127 80
Feb. 26,	Lumsden & Van Stone Company.	Lowest of three bids in competition; advertised.	Iron castings for year ending January 31, 1910. Estimated quantities: 800,000 pounds No. 1..... 160,000 " No. 2.....	\$2.58 cents per pound. 2.20 " "	23,788 35		23,788 35
Feb. 26,	Hugh Nawn Contracting Company.	Lower of two bids in competition; advertised.	Teaming water pipes, etc., for year ending January 31, 1910.	75 cents per ton 2,000 pounds, within 2½ miles from pipe yard. \$1.40 per ton 2,000 pounds, over 2½ miles from pipe yard.	934 30		934 30

¹ Changed to "B" weight subsequently.

MISCELLANEOUS CONTRACTS.—*Concluded.*
Contracts marked thus () are completed.*

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT.	WORK.	PRICE OR AMOUNT.	PAID ON CONTRACT.		
					Previous Year.	Year 1909-10.	Total.
1909.							
* April 14,	Florence Iron Works..	Only bid received; advertised.	66 tons 4-inch cast-iron water pipes, with flexible joints, delivered at 710 Albany street.	\$34.90 per ton 2,000 pounds....	.....	\$2,306 49	\$2,306 49
* April 27,	Coffin Valve Company,	Lowest of three bids in com- petition; adver- tised.	Four 36-inch valves.....	\$706 each.....	.....	2,824 00	2,824 00
* May 11,	George E. Gilchrist Company.	Lowest of eleven bids in compe- tition; adver- tised.	1,000 $\frac{5}{8}$ -inch American water meters. 500 $\frac{3}{4}$ -inch " "	\$5.95 each 8.90 "	Less am't deduction,	10,400 00 333 75	10,066 25
* June 19,	The White Company..	Authority of Mayor, with- out advertising for bids.	One 30 horse power White steam emergency car.	\$2,000.....	.....	\$2,000 00	2,000 00
* June 25,	Boston Ice Company.	One of two bids in competition; advertised; other bid, In- dependent Ice Company, the same except no price was bid for Districts 5 and 6.	Ice for drinking fountains from June 19 to September 19, 1909: District 1, City Proper..... " 2, East Boston..... " 3, South Boston..... " 4, Charlestown..... " 5, Roxbury..... " 6, West Roxbury.....	..... \$3.00 per ton 2,000 pounds. 3.50 " " " 3.50 " " " 3.00 " " " 3.50 " " " 3.50 " " "	.....	.....	†
* Aug. 10,	Hersey Manufactur- ing Company.	Lowest of ten bids in competition; advertised.	2,500 $\frac{5}{8}$ -inch water meters..... 1,200 $\frac{3}{4}$ -inch " "..... 150 1-inch " ".....	\$5.60 each 8.40 " 11.20 "	.....	25,760 00	25,760 00

* Aug. 23,	Fred S. & A. D. Gore Corporation.	Without competition.	Repaving with brick about 240 square yards in Webster avenue and Greenough lane.	\$2.25 per square yard.....	667 00	667 00
* Sept. 21,	William Higgins	Without competition.	Paving at various places throughout the city.	\$2.90 per square yard for pitch and pebble concrete base. 65 cents per square yard for paving with gravel joints.	2,405 16	2,405 16
Dec. 6,	Eastern Salt Company,	Only bid received; advertised.	2,600 sacks salt to be delivered at engine houses and 710 Albany street.	65 cents per sack 140 pounds....	1,690 00	1,690 00
Dec. 21,	National Meter Company.	Authority of Mayor, without advertising for bids.	20 2-inch Crown meters..... 3 3-inch " 1 4-inch " 1 6-inch "	\$70 each. 135 " 250 " 500 "		
Dec. 21,	Hersey Manufacturing Company.	Authority of Mayor, without advertising for bids.	1,200 ½-inch disc meters..... 10 2-inch rotary meters..... 2 3-inch "	\$5.60 each. 65.00 " 135.00 "		
* Dec. 24,	The White Company..	Authority of Mayor, without advertising for bids.	One 30 horse power White steam emergency car.	\$2,000.....	2,000 00	2,000 00

† \$3,592.63 paid from special appropriation.

CONTRACTS FOR TRENCH WORK, ETC.

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT.	LOCATION.	QUANTITIES AND PRICES BID.				PAID ON CONTRACT.	
				Linear Feet of Trench.	Cu. Yds. Excavation and Refilling.	Cu. Yds. Rock Excavation.	Sq. Yds. Paving.	Extra Work.	Total.
1908.									
July 3,	John H. Gerrish.....	Lowest bid in competition; advertised.	Laying 12-inch water pipes, flexible joints, between Moon and Long Islands.	3,231 @ \$3 40	.....	14 @ \$15	.....	\$10 06	\$11,205 46
July 3,	John H. Gerrish.....	Lowest bid in competition; advertised.	Laying 4-inch water pipes, flexible joints, between Long and Rainsford Islands.	3,534 @ \$3 95	.....	32.1 @ \$15	.....	203 57	14,644 17
Oct. 7,	Thomas H. Connolly.....	Only bid in response to invitation; not advertised.	Laying 12-inch water pipes in Terminal street, Charlestown.	924 @ 90c.	7.6 @ 50c.	16.1 @ \$4	15.7 @ 30c.	43 70	948 21
Nov. 12,	Thomas H. Connolly.....	Lowest bid in competition; not advertised.	Relaying water pipes in Chelsea street, East Boston, from south side of Porter street to 20 feet beyond north line of Brooks street. (16-inch in place of 12-inch.)	1,359 @ 70c.	47.7 @ \$1	@ 1c.	25½ @ 75c.	257 26	1,275 26
Nov. 17,	Daniel E. Lynch.....	Lowest bid in competition; not advertised.	Relaying water pipes in Chelsea street, East Boston, from south side of Porter street to and partly across Maverick street. (16-inch in place of 12-inch.)	340 @ 90c.	14.7 @ 80c.	@ \$3	122 @ 50c.	.....	378 76 *
1909.									
Mar. 25,	Thomas Burke.....	Lowest bid in competition; not advertised.	Laying 12-inch water pipes in Normandy street, Dorchester.	292 @ 59c.	2.7 @ 85c.	1 @ \$2	.....	12 80	189 38

WATER DEPARTMENT.

15

April 8,	William J. Rafferty & Co.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Swallow street, West Roxbury.	395 @ 40c.	8 @ 40c.	114.9 @ \$4 75	.....	1 30	708 28
April 8,	Robert Eagar, Jr.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Evergreen street, Roxbury, from South Hunting-ton avenue.	267 @ 37c.	15 @ 60c.	56.9 @ \$3 70	2.7 @ 30c.	.....	319 13
April 8,	John McCourt & Co.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Powelton road, Dorchester, from Columbia road to Glenarm street.	346 @ 52c.	20.3 @ 75c.	72 @ \$3 25	1 @ 10c.	.....	429 25
April 12,	Bryne Contracting Company...	Lowest bid in competition; ad-vertised.	Laying 8-inch, 10-inch and 12-inch water pipes in Old Colony avenue, from Dor-chester avenue to Dorchester street.	2838.5 @ 33c.	.....	.....	.....	182 18	1,118 89
April 15,	Charles M. Callahan.....	Lowest bid in competition; not advertised.	Laying 8-inch and 10-inch water pipes in Edgewater drive, Malta and Tokio streets, Dorchester.	360.5 @ 42c.	16.5 @ 60c.	@ 1c.	.....	31 05	192 36
April 22,	Charles M. Callahan.....	Lowest bid in competition; ad-vertised.	Laying 12-inch and 10-inch water pipes in Boston embankment of Charles River Basin.	2,589 @ 34c.	11 @ 50c.	@ \$3	.....	95 02	980 78
May 1,	William L. Dolan.....	Lowest bid in competition; not advertised.	Laying 12-inch water pipes in Aspinwall road, Dorchester.	207 @ 75c.	10.5 @ \$1	@ \$4	@ 50c.	.....	165 75
May 7,	Thomas Burke.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Princeton avenue, Radcliffe road and Quint avenue, Brighton.	648 @ 44c.	6.7 @ 50c.	@ 1c.	.....	9 20	297 67
May 13,	William L. Dolan.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Denton terrace, West Roxbury.	701.5 @ 54c.	14 @ 50c.	@ 1c.	@ 1c.	9 20	395 01
May 15,	J. H. Ferguson.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Radcliffe street, Dorchester, from Faxon street to Carmen street.	269 @ 37c.	22.1 @ 50c.	@ \$3	@ 40c.	.....	110 58
May 17,	Frank H. Cowin Company.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Wilcock street, Dorchester, from Blue Hill avenue to Morton street.	762 @ 39c.	6.3 @ 50c.	62 @ \$4 25	@ 50c.	.....	563 83

* Work taken from contractor February 10, 1909, and completed by city.

CONTRACTS FOR TRENCH WORK, ETC.—Continued.

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT.	LOCATION.	QUANTITIES AND PRICES BID.				PAID ON CONTRACT.	
				Linear Feet of Trench.	Cu. Yds. Excavation and Refilling.	Cu. Yds. Rock Excavation.	Sq. Yds. Paving.	Extra Work.	Total.
1909. May 17,	Charles M. Callahan.....	Lowest bid in competition; not advertised.	Relaying water pipes in Clark street, from Hanover street to North street (10-inch in place of 6-inch).	382 @ 74c.	21 @ 50c.	@ 1c.	18 @ 25c.	\$14 66	\$312 34
May 18,	Charles J. Jacobs Company.....	Next to lowest bid in competition; advertised. Lowest bid (at \$1.30 for 30-inch pipe, 55 cents for 12-inch pipe, 50 cents for earth excavation, \$5 for rock excavation) withdrawn.	Laying 30-inch and 12-inch water pipes in Sleeper street, Northern avenue, etc.	5,750 @ 30-in. \$1 67 2,003 12-in. @ 73c.	62 @ 50c.	Lumber in place, 13,800 @ \$15	er left in feet B. M.	1,591 25	12,893 94
May 22,	George J. Twiss.....	Lowest bid in competition; not advertised.	Laying 12-inch water pipes in Melville road, Dorchester.	817 @ 48c.	19.6 @ \$1	4 @ \$5	5 @ 25c.	5 75	438 76
May 29,	Charles M. Callahan.....	Lowest bid in competition; not advertised.	Relaying water pipes in Harris street, from Hanover street to North street (8-inch in place of 4-inch).	354 @ \$1 20	7 @ 75c.	@ 1c.	18 @ 35c.	24 44	460 79
June 2,	John McCourt & Co.....	Without competition; McCourt & Co. reconstructing street under contract with Street Department.	Relaying water pipes in Benton street, from Tremont street to Columbus avenue (10-inch in place of 6-inch).	@ 59c.	@ 75c.	@ \$3 95	@ 40c.	.....	*132 96
June 10,	Charles M. Callahan.....	Without competition.....	Relaying water pipes in Hanover avenue, from Hanover street to North street (6-inch in place of 4-inch).	333 @ \$1 15	19 @ 75c.	@ 1c.	19 @ 35c.	13 51	417 36

WATER DEPARTMENT.

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June 22,	Charles M. Callahan.....	Without competition.....	Relaying water pipes in Webster avenue, from Hanover street to Unity street (6-inch in place of 4-inch).	340 @ \$1 15	10 @ 75c.	@ 1c.	4 @ 35c.	25 30	425 20
June 24,	William J. Rafferty & Co.....	Lowest bid in competition; not advertised.	Relaying water pipes in Norway street, from Huntington avenue to Massachusetts avenue (10-inch and 12-inch in place of 6-inch).	985 @ 63c.	118 @ \$1	.....	15 @ 40c.	13 51	758 06
July 1,	Charles M. Callahan.....	Without competition.....	Relaying water pipes in Morton street, from Salem street to Endicott street (6-inch in place of 4-inch).	324 @ \$1 15	6 @ 75c.	@ 1c.	7 @ 35c.	22 71	402 26
July 2,	Christopher P. Conlin.....	Lowest bid in competition; not advertised.	Relaying water pipes in Richmond street, from Washington street to Dorchester avenue, and in Avondale place, Dorchester (8-inch in place of 6-inch).	900 @ 55c.	13.7 @ 50c.	4.3 @ \$3 75	6 @ 22c.	4 60	523 90
July 6,	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Ashland park, West Roxbury.	219 @ 60c.	19.3 @ 60c.	2 @ 1c.	4 @ 1c.	.....	143 04
July 14,	Charles M. Callahan.....	Without competition.....	Relaying water pipes in Greenough lane, from Commercial street to Charter street (6-inch in place of 4-inch).	292 @ \$1 15	8 @ 75c.	@ 1c.	11 @ 35c.	20 41	366 06
July 19,	Thomas Burke.....	Next to lowest bid in competition; advertised; lowest bid rejected.	Laying 10-inch water pipes in Melton road and Nottingham road, Brighton.	775 @ 40c.	3.3 @ 60c.	125.1 @ \$3 75	@ 1c.	.....	781 11
July 22,	Frank H. Cowin Company....	Lowest bid in competition; not advertised.	Laying 12-inch and 10-inch water pipes in St. Mary's street, Brookline, from Mountfort street to Beacon street.	997 @ 40c.	23.2 @ 50c.	@ 1c.	@ 60c.	20 70	431 10
July 22,	Charles M. Callahan.....	Without competition.....	Relaying water pipes in Cleveland place, from Margaret street to Snow Hill street (8-inch in place of 4-inch).	270 @ \$1 15	9 @ 75c.	@ 1c.	14 @ 35c.	9 49	331 64
July 30,	Daniel E. Lynch.....	Lowest bid in competition; not advertised.	Relaying water pipes in Malcolm street, from Mt. Vernon street to Chestnut street (6-inch in place of 4-inch).	240 @ \$1	@ 75c.	@ \$5	@ 50c.	.....	240 00
Aug. 2,	John T. Shea, Jr.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Lafield street, Dorchester, from Centre street to Dix street.	385 @ 48c.	14 @ 50c.	59.2 @ \$4	2.7 @ 1c.	4 60	433 23

* \$132.96 allowed for work done to June 8, 1909, on which date contract was taken away and work completed by city.

CONTRACTS FOR TRENCH WORK, ETC.—Continued.

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT.	LOCATION.	QUANTITIES AND PRICES BID.				PAID ON CONTRACT.	
				Linear Feet of Trench.	Cu. Yds. Excavation and Refilling.	Cu. Yds. Rock Excavation.	Sq. Yds. Paving.	Extra Work.	Total.
1909.									
Aug. 3.	Charles J. Jacobs Company ...	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Upland road, Brighton, from Brooks street.	435 @ 42c.	11.5 @ 40c.	@ \$2	1 1/4 @ 40c.	\$10 06	\$197 89
Aug. 3.	Charles M. Callahan.....	Lowest bid in competition; not advertised.	Relaying water pipes in Ivanhoe street from West Canton to Trumbull street; Trumbull street, from Ivanhoe to Newland street; Newland street from West Brookline to West Canton street (8-inch in place of 4-inch and 6-inch).	779 @ 65c.	21 @ 50c.	@ 1c.	260 @ 20c.	36 51	605 36
Aug. 4.	Frank A. Foster.....	Without competition.....	Laying 8-inch water pipes in Havelock street, Dorchester, from Blue Hill avenue to Morton street.	642.5 @ 33c.	11.2 @ 50c.	59.5 @ \$4	@ 35c.	1 73	457 36
Aug. 5.	Thomas Burke.....	Lowest bid in competition; not advertised.	Laying 10-inch water pipes in Allerton street, Roxbury, from Lansdowne street.	530 @ 40c.	4.4 @ 50c.	@ 1c.	@ 1c.	3 45	217 65
Aug. 14.	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 10-inch water pipes in Lena park, West Roxbury, from Harvard street.	634.3 @ 48c.	12.2 @ 50c.	17.5 @ \$3 45	@ 1c.	.....	370 94
Aug. 14.	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 10-inch water pipes in Edge-water drive, Dorchester, from Tokio street to Tesla street.	237 @ 57c.	5.3 @ 50c.	1 @ \$3 75	@ 1c.	8 05	149 54

Aug. 20,	Roger P. Cushing.....	Lowest bid in competition; not advertised.	Laying 10-inch water pipes in Greendale street, from Wellington Hill street, and in Robinson avenue, from Robinson street, Dorchester.	748 @ 49c.	10.9 @ 49c.	19.5 @ \$2 90	1 @ 1c.	.....	428 42
Sept. 3,	Frank A. Foster.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Guernsey street and Grover street, West Roxbury.	372.5 @ 55c.	22.5 @ 50c.	@ \$4	@ 50c.	4 31	220 44
Sept. 3,	John T. Shea, Jr.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Fletcher and Aldrich streets, West Roxbury.	419 @ 55c.	12 @ 75c.	@ \$4	@ 25c.	70 79	310 24
Sept. 4,	H. M. McBride.....	Lowest bid in competition; not advertised.	Laying 8-inch and 10-inch water pipes in Wadsworth and Champney streets, Brighton.	542.7 @ 42c.	16.5 @ 25c.	0.5 @ \$2 74	@ 25c.	.....	233 43
Sept. 9,	Christopher P. Conlin.....	Lowest bid in competition; not advertised.	Laying 8-inch and 12-inch water pipes in Boardman and Porter streets, East Boston.	521.7 @ 60c.	18.4 @ 10c.	.5 @ \$4 50	1 @ 25c.	.....	317 36
Sept. 10,	Thomas Burke.....	Lowest bid in competition; not advertised.	Laying 8-inch and 10-inch water pipes in Holworthy street, Roxbury, and Browning avenue, Dorchester.	516 @ 44c.	44.9 @ 80c.	@ 1c.	1 @ 25c.	15 46	278 67
Sept. 11,	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Woodcliff street, Dorchester.	235 @ 90c.	7.8 @ 50c.	30.8 @ \$2	@ 1c.	.....	277 00
Sept. 20,	John Guarino.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Broughton street, West Roxbury.	363 @ 35c.	7 @ 10c.	@ \$5	1 @ 10c.	16 35	144 20
Sept. 28,	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 8-inch and 10-inch water pipes in Elgin, Birch and Florence streets, West Roxbury.	420 @ 63c.	7.8 @ 50c.	18.4 @ \$3 50	@ 1c.	.....	332 90
Oct. 7,	Charles M. Callahan.....	Lowest bid in competition; advertised.	Relaying water pipes in Bunker Hill, Edgeworth and Ferrin streets, Charlestown (10-inch and 12-inch in place of 6-inch and 8-inch).	1,869 @ 55c.	112 @ 50c.	@ 1c.	422 @ 25c.	50 31	Work completed Dec. 17. \$939.76 paid, \$300 being held for 60 days.

CONTRACTS FOR TRENCH WORK, ETC.—Continued.

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT	LOCATION.	QUANTITIES AND PRICES BID.				PAID ON CONTRACT.	
				Linear Feet of Trench.	Cu. Yds. Excavation and Refilling.	Cu. Yds. Rock Excavation.	Sq. Yds. Paving.	Extra Work.	Total.
1909.									
Oct. 7,	Thomas Burke.....	Lowest bid in competition; not advertised.	Relaying water pipes in Alther street, Roxbury (8-inch in place of 4-inch).	284 @ 59c.	28.5 @ 70c.	@ 1c.	10 @ 35c.	\$3 45	\$194 46
Oct. 7,	Frank A. Foster.....	Without competition.....	Laying 8-inch water pipes in Baird street, Dorchester, from Blue Hill avenue to Morton street.	526 @ 33c.	2 @ 50c.	34 @ \$4	@ 35c.	21 85	332 43
Oct. 13,	Christopher P. Conlin.....	One of two lowest bids at same prices, in competition; advertised.	Relaying water pipes in C street, South Boston, from Baxter street to First street (10-inch and 12-inch in place of 6-inch).	@ 65c.	@ 50c.	@ 1c.	@ 50c.	.....	Work taken from contractor Dec. 21, 1909, to be completed by city. Amount paid contractor to date, \$545.
Oct. 18,	H. M. McBride	Lowest bid in competition; not advertised.	Laying 12-inch water pipes in Sutherland road, Brighton, between Lanark road and Commonwealth avenue.	303 @ 48c.	22.2 @ 30c.	4.2 @ \$3.79	@ 25c.	9 20	\$178 06
Oct. 18,	H. M. McBride.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Strathmore road, Brighton, from Englewood avenue.	305.5 @ 49c.	33.1 @ 30c.	1.7 @ \$1	@ 25c.	.....	152 16

Oct. 22,	Thomas Burke.....	Lowest bid in competition; not advertised.	Relaying water pipes in Dorchester avenue, south of Fort Point channel (8-inch in place of 6-inch).	180 @ 68c.	8 @ 70c.	@ 1c.	67 @ 50c.	9 20	170 70
Oct. 23,	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Harvard avenue, Dorchester, and Radcliffe road, Brighton.	604 @ 54c.	42.4 @ 50c.	@ \$2	@ 1c.	4.60	351 96
Oct. 27,	John Guarino.....	Lowest bid in competition; advertised.	Relaying water pipes in Morton and Washington streets, West Roxbury (16-inch in place of 6-inch and 8-inch).	@ 59c.	@ 40c.	@ 1c.	@ 50c.	.....	Work completed Dec. 15. \$271.40 paid on account; \$313.76 unpaid.
Nov. 1,	Charles M. Callahan.....	Lowest bid in competition; not advertised.	Laying 10-inch water pipes in Seneca street, from Albany street to Harrison avenue.	489 @ 54c.	280 @ 75c.	@	.....	72.45	\$546 51
Nov. 5,	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying 10-inch water pipes in Assabet and Intervale streets, Dorchester.	357.5 @ 60c.	10.1 @ 50c.	53.1 @ \$3 75	@ 1c.	.....	418 68
Nov. 5,	John Guarino.....	Lowest bid in competition; advertised.	Laying 16-inch water pipes in Granite street, South Boston.	@ 60c.	@ \$1	@ \$1 50	@ 25c.	.....	Work taken from contractor Dec. 17, 1909, to be completed by city. Amount paid contractor to date, \$270.
Nov. 8,	Thomas Burke.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Howland and Harold streets, Roxbury.	533.5 @ 44c.	40.8 @ 80c.	@ 1c.	@ 1c.	51 47	Work completed: \$243.85 paid, \$75 being held for 60 days.

CONTRACTS FOR TRENCH WORK, ETC.—*Concluded.*

DATE.	CONTRACTORS.	MANNER OF AWARDING CONTRACT.	LOCATION.	QUANTITIES AND PRICES BID.				PAID ON CONTRACT.	
				Linear Feet of Trench.	Cu. Yds. Excavation and Rebilling.	Cu. Yds. Rock Excavation.	Sq. Yds. Paving.	Extra Work.	Total.
1909.									
Nov. 8,	Roger P. Cushing.....	Lowest bid in competition; not advertised.	Relaying water pipes in Meehan street, West Roxbury (10-inch in place of 6-inch).	400 @ 58c.	37 @ 58c.	@ 1c.	@ 25c.	\$1 73	\$255 19
Nov. 12,	H. M. McBride.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Lotus place and Guernsey street, West Roxbury, and in Malta street, Dorchester.	917 @ 50c.	20.9 @ 50c.	@ \$3 98	7 @ 25c.	24 73	495 43
Nov. 13,	James J. O'Brien.....	Lowest bid in competition; not advertised.	Laying about 300 feet and relaying about 350 feet of 10-inch water pipes in Beacon street, Brighton, from Chestnut Hill avenue to Brookline line.	627.5 @ 57c.	41 @ 50c.	19.4 @ \$3 50	@ 1c.	15 24	Work completed. \$311.32 paid, \$150 being held for 60 days.
Nov. 27,	William J. Rafferty & Co.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Fox street, Dorchester.	347 @ 65c.	26 @ 75c.	@ \$3 50	@ 1c.		Work completed. \$170.05 paid, \$75 being held for 60 days.
Nov. 29,	Roger P. Cushing.....	Lowest bid in competition; not advertised.	Laying 8-inch and 10-inch water pipes in Alabama and Elene streets, Dorchester.	588 @ 48c.	4.4 @ 48c.	70 @ \$3	@ 20c.	2 30	Work completed. \$396.65 paid, \$100 being held for 60 days.

Dec. 10,	John T. Shea, Jr.....	Lowest bid in competition; not advertised.	Relaying water pipes in Eastman street, Dorchester, from Columbia road (10-inch in place of 6-inch).	329.5 @ 59c.	23.3 @ 75c.	@ 1c.	2 @ 1c.	17 25	Work completed. \$154.16 paid, \$75 being held for 60 days.
Dec. 11,	Frank H. Cowin Company.....	Lowest bid in competition; not advertised.	Laying 8-inch water pipes in Cawfield street, Dorchester, from Eastman street to Elder street.	@ 44c.	@ 75c.	@ \$5	@ 50c.		Not completed. \$80.55 paid on account.
Dec. 21,	William J. Rafferty & Co.....	Without competition; at same prices as contract of Nov. 27, 1909, for Fox street, Dorchester.	Laying 8-inch water pipes in Marie street, Dorchester, from Mt. Ida road.	@ 65c.	@ 75c.	@ \$3 50	@ 1c.		Not completed.

CONTRACTS FOR BLASTING ROCK IN PIPE TRENCHES,—MADE WITHOUT ADVERTISING FOR BIDS.

DATE.	CONTRACTOR.	Manner of Awarding Contract.	LOCATION.	Quantity Paid for.	Price or Amount.	Paid on Contract.
1908. Dec. 16,	John McCourt.....	Lowest bid in competition.....	Commonwealth terrace, Brighton.....	81 cubic yards.....	\$3 75	\$303 75
Dec. 26,	Thomas Burke.....	Lowest bid in competition.....	Hollingsworth street, Dorchester.	17.2 cubic yards.....	4 49	77 23
1909. Aug. 4,	John Guarino.....	Lowest bid in competition.....	Lawrence park, Dorchester.....	97.6 cubic yards.....	4 75	463 60
Aug. 19,	James H. Ferguson....	Without competition...	Rexford street, Dorchester.....	102.1 cubic yards.....	5 25	536 03
Sept. 3,	James J. O'Brien.....	Lowest bid in competition.....	Evergreen street, Roxbury.....	37.1 cubic yards.....	5 00	185 50
Sept. 20,	John Varnerin & Sons..	Lowest bid in competition.....	Mountain avenue, Dorchester.....	28.7 cubic yards.....	3 99	114 51

REPORT OF INCOME DIVISION.

OFFICE OF GENERAL SUPERINTENDENT,
CITY HALL, BOSTON, February 1, 1910.

WILLIAM E. HANNAN, ESQ.,
Water Commissioner:

DEAR SIR,— I submit herewith the annual report of the Income Division, Water Department. The report of the Meter Service Division, also the statement of water rates, covers the financial year ending January 31, 1910; the remainder of the report is rendered for the calendar year ending December 31, 1909, it being impracticable, owing to the nature of our accounts, to render it for the financial year.

Respectfully submitted,

J. H. CALDWELL,
General Superintendent Income Division.

TABLE 1.

Statement of Water Rates, January 31, 1910.

ACCOUNT OF YEAR.	Amount Assessed.	Amount Abated.	Amount Collected.	Balance Outstanding.
1895.....	\$2,266,519 08	\$55,510 53	\$2,211,008 55	.....
1896.....	2,568,246 04	* 95,162 39	2,473,083 65	.....
1897.....	2,630,413 37	53,864 09	2,576,549 28	.....
1898.....	2,342,804 58	† 235,414 43	2,107,390 15	.....
1899.....	2,414,731 72	† 258,449 66	2,156,282 06	.....
1900.....	2,197,026 64	46,873 45	2,150,153 19	.....
1901.....	2,264,845 26	46,713 28	2,218,131 98	.....
1902.....	2,327,996 91	43,706 89	2,284,290 02	.....
1903.....	2,386,428 02	58,050 51	2,328,347 51	\$30 00
1904.....	2,391,751 16	38,290 92	2,352,679 94	780 30
1905.....	2,446,978 39	36,093 08	2,410,871 31	14 00
1906.....	2,524,105 25	37,599 28	2,486,505 97	.....
1907.....	2,619,031 00	34,959 33	2,584,071 67	.....
1908.....	2,645,888 58	35,674 96	2,608,402 32	1,811 30
1909.....	2,693,634 16	30,696 28	2,624,390 53	38,547 35
1910 †.....	1,206,566 80	1,613 19	91,661 65	1,113,291 96

The above amounts for the years 1895, 1896 and 1897 include both Mystic supply and Cochituate accounts. The contracts to supply Chelsea, Somerville and Everett with Mystic water were abrogated by the Metropolitan Water Act of January 1, 1898.

* This amount includes certain city department accounts, abated by order of the Mayor.

† These amounts include abatements of city department accounts, under order of the City Council, approved by the Mayor on March 5, 1900, said order also abolishing all charges for water used by city departments.

‡ The statement of water rates for the year 1910 represents annual accounts only; the quarterly meter accounts can only be estimated at this time.

TABLE II.

Kind and Number of Fixtures in use December, 1909.

	Number.
Bath tubs.....	95,144
Bowls.....	130,567
Foot tubs.....	271
Sinks.....	200,450
Taps.....	37,803
Urinals, automatic.....	5,067
Urinals, otherwise.....	571
Washtubs.....	156,992
Water-closets.....	196,308
Total.....	823,173

TABLE III.

Number and Amount of Abatements Allowed During Year.

ON ACCOUNT OF ASSESSMENTS FOR YEAR.	Number.	Amount.
1906.....	2	\$65 00
1907.....	141	2,314 38
1908.....	1,743	15,656 30
1909.....	3,102	29,425 80
Totals	4,988	\$47,461 48

TABLE IV.

Applications for New Pipes.

Elevator pipes.....	14
Fire pipes.....	71
Service pipes.....	1,495
Total.....	1,580

TABLE V.
Turning Water Off and On.

For complaints.....	765
For repairs of services.....	3,800
For nonpayment of water bills.....	2,609
For waste.....	120
Turned on first time.....	1,370
Vacancies.....	2,062
Total.....	10,726

TABLE VI.
Off and On Receipts.

Received for turning off and on for repairs, and deposited with City Collector...	\$1,947
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TABLE VII.
WASTE DETECTION.
Water Inspection.

Waste reports.....	13,390
First examination and found repaired.....	7,236
Second examination and found repaired.....	3,342
Third examination and found repaired.....	1,341
Fine notices issued.....	249

TABLE VIII.
Defective Fixtures and Waste.

Tank fixtures leaking.....	12,964
Faucets leaking.....	6,761
Bursts inside.....	274
Bursts outside.....	59
Hopper-cocks leaking.....	68
Water-closets leaking.....	59
Wilful waste.....	30

TABLE IX.

Elevator Service for the Year Ending December 31, 1909.

Under supervision December 31, 1908.....	584
Discontinued during the year.....	9
Changed to electric.....	4
New elevators accepted during the year.....	12
Under supervision December 31, 1909.....	583
Changed to tank and metered water and now under supervision.....	69
Registered inaccurately and repaired by owners.....	62
Clock cord broken and repaired by owners.....	53
Clock hands broken and repaired by owners.....	13

TABLE X.

Motor Service for the Year Ending December 31, 1909.

Under supervision December 31, 1908.....	118
Discontinued during the year.....	1
Under supervision December 31, 1909.....	117
Motors on meter.....	16

TABLE XI.

Fire Pipe Service for the Year Ending December 31, 1909.

Premises under supervision December 31, 1908.....	552
Supervision discontinued during the year.....	11
Premises equipped during the year.....	19
Under supervision December 31, 1909.....	560
Premises inspected.....	3,936
Total number of inspections of outlet valves.....	47,428
Total number of hydrant inspections.....	1,069
Total number of valves sealed and resealed.....	4,345
Total number of hydrant valves sealed and resealed.....	201
Meter by-passes under supervision December 31, 1908.....	37
Discontinued.....	2
By-passes, additional.....	1
Under supervision December 31, 1909.....	36
Inspections made of by-passes.....	288
By-passes resealed.....	12

TABLE XII.

METERS.

General Statement of Work Performed During Year Ending January 31, 1910.

	Meters.	Boxes.
Applied.....	6,959	887
Discontinued.....	290	
Changed.....	1,221	
Changed location.....	166	
Tested.....	11,300	
Repaired at shop.....	987	
Repaired at factory.....	96	
Repaired in service.....	654	142
Examined.....	7,206	
Lost (in service).....	4	
Hayed.....	2,168	
Condemned.....	246	
Purchased.....	8,888	
In service.....	12,049	
In service (private).....	133	
At department shop.....	2,330	

TABLE XIII.

Statement of Meters for the Year Ending January 31, 1910.

Meters belonging to the department January 31, 1909.....	5,741	
Purchased.....	8,888	
	<hr/>	14,629
Condemned during year.....	246	
Lost (in service).....	4	
	<hr/>	250
Belonging to department January 31, 1910.....		14,379

Distribution of Meters January 31, 1910.

In service.....	12,049	
In shop.....	2,330	
	<hr/>	<u>14,379</u>

TABLE XIV.

Meters Owned by Department January 31, 1910.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Crown.....	14	52	90	163	215	418	559	1,210	2,721
Worthington.....		12	26	96	80	304	136	3	657
Hersey.....	12	20	51	154	174	278	381	20	1,090
Metropolitan.....				1	6	18	176		201
Hersey disc.....	1		7	7	86	237	1,391	4,150	5,879
B. W. W.....							21		21
Lambert.....		2		2	14	75	124	331	548
Nash.....			3		44	127	249	413	836
Thomson.....							2	6	8
Gem.....	7	6	4	2					19
Empire.....					7	5	2		14
Trident.....						2	5	205	212
Keystone.....			2	1	2	22	87	188	302
Worthington disc.....				18		6	45	169	238
Torrent.....	1								1
Standard.....					1			15	16
Worth turbine.....		1							1
American.....							520	1,095	1,615
Totals.....	35	93	183	444	629	1,492	3,698	7,805	14,379

TABLE XV.

Meters at Department Shop January 31, 1910.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Crown.....	2	3	6	33	7	9	25	37	122
Empire.....							1		1
Keystone.....							2	4	6
Nash.....					6	3	9	11	29
American.....							39	59	98
Trident.....						1	1	11	13
Lambert.....		2		1		2	4	8	17
Worth disc.....				2		1	2	6	11
Metropolitan.....				1	1		6		
Hersey.....	1		3	10	4	5	5	6	34
Worthington.....		2	3	5	1	9	3	2	25
Gem.....	1	1	4	1					7
Standard.....								1	1
Hersey disc.....			1	2	2	52	818	1,083	1,958
Totals.....	4	8	17	55	21	82	915	1,228	2,330

TABLE XVI.

Private Meters in Service January 31, 1910.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Worthington.....			2	5	3	8	3	11	32
Crown.....	6	3	2	5	19	9	4	32	80
Hersey.....		3	2	1	2	4		1	13
Gem.....	2								2
B. W. W.....							1		1
Nash.....								1	1
Hersey disc.....					1				1
Thomson.....					1				1
Ball & Fitts.....				1					1
Torrent.....		1							1
Totals.....	8	7	6	12	26	21	8	45	133

TABLE XVII.
Meters in Service January 31, 1910.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Crown.....	12	49	84	130	208	409	534	1,173	2,599
Worthington.....	.....	10	23	91	79	295	133	2	633
Hersey.....	11	20	48	144	170	273	376	14	1,056
Metropolitan.....	.....	.....	.....	.....	5	18	170	.....	193
Hersey disc	1	.....	6	5	84	185	573	3,066	3,920
B. W. W.....	.....	.....	.....	.....	.....	.....	21	.....	21
Lambert.....	.....	.....	.....	1	14	73	120	323	531
Nash.....	.....	.....	3	.....	38	124	240	402	807
Thomson.....	.....	.....	.....	.....	.....	.....	2	6	8
Gem.....	6	5	.....	1	.....	.....	.....	.....	12
Empire.....	.....	.....	.....	.....	7	5	1	.....	13
Trident.....	.....	.....	.....	.....	.....	1	4	194	199
Keystone.....	.....	.....	2	1	2	22	85	184	296
Worthington disc .....	.....	.....	.....	16	.....	5	43	163	227
Torrent.....	1	.....	.....	.....	.....	.....	.....	.....	1
Standard.....	.....	.....	.....	.....	1	.....	.....	14	15
Worth turbine.....	.....	1	.....	.....	.....	.....	.....	.....	1
American.....	.....	.....	.....	.....	.....	.....	481	1,036	1,517
Totals.....	31	85	166	389	608	1,410	2,783	6,577	12,049

TABLE XVIII.
Meters Purchased.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Nash.....	38	40	130	387	595
Hersey disc	11	160	1,280	4,015	5,466
Keystone.....	20	60	185	265
Standard.....	1	.....	.....	15	16
Crown.....	2	1	11	25	14	.....	.....	.....	53
Hersey.....	2	7	14	.....	.....	.....	.....	23
Trident.....	5	205	210
Lambert.....	2	.....	.....	11	50	95	325	483
Worthington disc	15	145	160
Worth turbine.....	1	.....	.....	.....	.....	.....	.....	1
American.....	520	1,096	1,616
Totals.....	2	6	18	39	75	270	2,105	6,373	8,888

TABLE XIX.

Meters Condemned During Year.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Crown.....							1	3	4
Worthington.....		6	2	18	14	45	60	.....	145
Metropolitan.....					3	15	75	.....	93
Ball & Fitts.....				1			1	.....	2
B. W. W.....							1	.....	1
Rogers.....							1	.....	1
Totals		6	2	19	17	60	139	3	246

TABLE XX.

Meters Repaired in Service.

CAUSE OF REPAIRS.	Number.
Clock broken.....	50
Glass broken.....	40
Cover broken.....	19
Spindle leaking.....	76
Coupling leaking.....	317
Stopcock leaking.....	17
Leak at joint.....	4
Relocated.....	131
Total.....	654

TABLE XXI.

Meters Repaired at Factory.

	DIAMETER IN INCHES.								Totals.
	6	4	3	2	1½	1	¾	⅝	
Crown.....		2	.....	3	3	15	14	31	68
Hersey.....		1	1	1	6	5	9	1	24
Hersey disc.....					2	.....	1	1	4
Totals.....		3	1	4	11	20	24	33	96

TABLE XXII.

Meters Changed.

CAUSE.	Number.
Test.....	401
Not registering.....	437
No force.....	76
Stoppage.....	29
Enlarged.....	50
Leak at spindle.....	33
Leak at coupling.....	47
Leak at stopcock.....	2
Set backward.....	43
Relocated.....	35
Defaced.....	33
Frost.....	35
Total.....	1,221

TABLE XXIII.

Meters Discontinued During Year.

SIZES.	Number.
$\frac{3}{8}$ -inch.....	176
$\frac{1}{2}$ -inch.....	51
1-inch.....	17
1 $\frac{1}{2}$ -inch.....	27
2-inch.....	13
3-inch.....	3
4-inch.....	3
Total.....	290

TABLE XXIV.

Meters Applied During Year.

SIZES.	Number.
$\frac{5}{8}$ -inch.....	5,421
$\frac{3}{4}$ -inch.....	1,190
1-inch.....	218
1 $\frac{1}{2}$ -inch.....	74
2-inch.....	31
3-inch.....	16
4-inch.....	6
6-inch.....	3
Total.....	6,959

REPORT OF DISTRIBUTION DIVISION.

OFFICE OF THE SUPERINTENDENT,
710 ALBANY STREET, February 1, 1910.

WILLIAM E. HANNAN, ESQ.,
Water Commissioner:

SIR,— Following is the annual report of the Distribution Division for the year ending January 31, 1910.

ORGANIZATION.

From February 1, 1909, to March 1, 1909, the division was in charge of Chief Clerk George H. Finneran, who had been acting as "Official in Charge" since March 26 of the preceding year. On March 1, 1909, he was made superintendent of the Distribution Division, which office he now holds. The present organization is as follows:

Superintendent.— George H. Finneran.

Assistant Superintendent (Northern Division).— Adam McClure.

Assistant Superintendent (Southern Division).— John W. Leahon.

Chief Clerk.— George A. Pratt.

8 clerks.

1 switch board operator.

2 messengers.

2 janitors.

Machine Shop.— Foreman, Edward J. Bachelder.

21 machinists, helpers, etc.

5 blacksmiths and helpers.

1 accountant.

1 engineman.

1 fireman.

1 patternmaker.

1 patternmaker's helper.

Carpenter Shop.— Foreman, Richard F. Neagle.

9 carpenters.

1 laborer.

Plumbing Shop.— Foreman, B. F. Rogers.

13 plumbers, electricians and helpers.

2 laborers (trough cleaners).

Storeroom.— Storekeeper, John W. Sullivan.

2 assistants.

Main Yard (Albany street).— Foreman, John J. Maguire.

37 yardmen.

22 teamsters, drivers and chauffeurs.

11 stablemen.

6 painters.

8 concrete box makers and helpers.

5 men in yard storehouse.

Gate Inspection.— Foreman, Samuel J. Hallett.

7 men.

General Inspection.

7 inspectors.

Main Pipe Gangs.

Foreman Doherty and 24 men.

Foreman Durand and 20 men.

Central District (Repairers and Service Pipe Men).—Foreman, William T. Lenehan.

2 subforemen.

39 repairers.

15 service pipe men.

16 off-and-on men.

12 watchmen and emergency men.

Brighton District.—Foreman, Thomas Neville.

16 men in Brighton yard.

4 men at Fisher Hill Reservoir.

Charlestown District.—Foreman, Patrick Kelly.

22 men.

Dorchester District.—Foreman, Timothy Casey.

23 men.

East Boston District.—Foreman, Dennis Regan.

19 men.

West Roxbury District.—Foreman, Thomas C. McDonald.

23 men.

Parker Hill Reservoir.

2 men.

Unattached.

6 men.

It is, of course, impracticable to maintain throughout the year an organization corresponding exactly to the foregoing. For the months of December, January and February a special force of hydrant inspectors is drafted from the various gangs of the division to maintain the hydrants in the central district in a condition for immediate use. There are at the present time 30 men so engaged. They include the gate inspection force, which cannot be employed to advantage in its regular line during the cold weather. Transfers of men from one class of work to another are made as required, but in the main the distribution of employees is as outlined.

There are now 435 men in the Distribution Division. One year ago the total number was 421. During the year 26 men were transferred from the Income Division to the Distribution Division because of the assumption by the latter division of the work of shutting off and letting on service pipes; 8 men were transferred for various reasons from the Income Division to the Distribution Division; 6 men were reinstated; 30 new men were employed; 32 men were transferred for various reasons from the Distribution Division to the Income Division; 10 men died; 4 men resigned to accept other positions; and the names of 10 men were dropped from the rolls because of long continued absence.

The average number of men at work daily during the year was 381. The average number of men absent daily during the year was 33. The lowest number of men in the force during the year was 408. The highest number was 436. The number of men 10 years or longer in service is 363; 15 years or longer, 158; 20 years or longer, 120; 25 years or longer, 42; and 30 years or longer, 21. The maximum length of service is 56 years. 163 men entered the department at the age of 40 years and older; 103 at the age of 45 years and older; 58 at the age of 50 years and older; 25 at the age of 55 years and older; and 8 at the age of 60 years and older.

MAIN PIPE LAYING.

During the year **63,327** linear feet of mains were laid, relaid and relocated, and **20,781** linear feet were abandoned and either taken from the ground or left therein, as conditions warranted. Gate valves, air valves and blow-offs were established and abandoned, as stated in Table No. 1, appended to the text. The total mileage of mains now owned and operated by the department is **761.23**, consisting almost entirely of cast-iron pipe, there being but 4,985 feet of 30-inch and 6,180 feet of 20-inch wrought-iron cement-lined pipe in the system.

Of the total amount laid, 1,170 feet of 6-inch, 14,788 feet of 8-inch, 6,995 feet of 10-inch, 11,437 feet of 12-inch and 359 feet of 16-inch were laid to supply new buildings in streets where water mains had not been laid and high service to buildings in the business section.

To improve the general supply in the South Boston district, 1,645 feet of 16-inch, 377 feet of 24-inch and 6,478 feet of 30-inch were laid.

In replacing old and inadequate mains there were laid 1,629 feet of 6-inch, 3,877 feet of 8-inch, 4,210 feet of 10-inch, 3,302 feet of 12-inch and 2,848 feet of 16-inch.

On account of the construction of sewers, streets and bridges, the abolishment of grade crossings, the laying of street car rails and other public works it was necessary to relocate the following lengths of main pipe: 10 feet of 4-inch, 127 feet of 6-inch, 441 feet of 8-inch, 1,414 feet of 10-inch, 1,509 feet of 12-inch, 238 feet of 16-inch, 122 feet of 20-inch, 35 feet of 24-inch and 313 feet of 36-inch.

The most important pipe laying of the year was as follows: The 30-inch line in Northern avenue, C

street and Sleeper street; the 30-inch line in Congress street, between Atlantic and Dorchester avenues; the 24-inch and 16-inch lines upon the trestle at Congress street pipe tunnel; the 16-inch line in Granite street; the 12-inch line in Northern avenue; the 12-inch line in Old Colony avenue; the 12-inch line in Charles River Embankment; the 12-inch and 10-inch lines in St. Mary's and Mountfort streets; the 10-inch line in Park street, Longwood; and the replacement of old and inadequate mains in Chelsea street, East Boston; Washington and Morton streets, West Roxbury; C street, South Boston; Norway, Seneca, Exchange, Malcolm, Ivanhoe, Trumbull, Newland, Harris, Clark and Morton streets, Cleveland place, Greenough lane, Hanover, Franklin and Webster avenues, city proper; Bellevue and Autumn streets, Roxbury; and Bunker Hill, Edgeworth and Ferrin streets, Charlestown.

For some years past South Boston has had but one supply main with a capacity of anything like present day requirements, viz., the 30-inch main that enters the district by way of Massachusetts avenue, Southampton street, Dorchester avenue and D street. The only other feed mains were the old 20-inch entering through Dover and Fourth streets and the 20-inch leading from the Dudley street 24-inch main at Columbia road, through Columbia road, Boston and Dorchester streets. Should any accident have happened to the 30-inch main South Boston would have been in a bad way, especially the new section in the vicinity of Summer street extension and the Commonwealth docks, now rapidly being developed. It was considered desirable to have an additional supply main enter the district by way of Congress street, leading from the 30-inch main at Franklin and Congress streets easterly through Congress street to Fort Point channel, under the channel and thence into South Boston. A portion of this work had been done,—the 30-inch main in Congress street, between Franklin street and Atlantic avenue,—and a pipe tunnel had been built under the channel and two lines of pipe laid therein, viz., 24-inch and 20-inch. During the past year the 30-inch main has been continued from Congress street at Atlantic avenue, through Congress street to Dorchester avenue, thence to the pipe trestle approaching the tunnel shaft, where it was reduced to 24-inch, across the trestle to the tunnel shaft, through the tunnel, across the easterly trestle and connecting

upon land with the 24-inch laid a few years ago in Congress street, South Boston. This piece of main extended but a short distance to Sleeper street, where it was capped after a connection had been made with the 16-inch Congress street distribution pipe. Starting at the cap mentioned we resumed, laying a 30-inch line through Sleeper street to Northern avenue, through Northern avenue to C street, through C street to Danby street, where the line ended, connecting with the 30-inch line that enters South Boston by way of Massachusetts avenue and Southampton street and continues through Dorchester avenue, D street and Danby street to the point mentioned at C street. When the water is turned on through this line South Boston will be much better than ever supplied.

The new portion of South Boston north of First street is without-high service, and as many large buildings of mercantile character have been erected therein the extension of the high service from the city proper is an imperative requirement. During the year the department laid about 422 feet of 16-inch main upon and near the pipe trestle approaching the Congress street tunnel, thus leaving but 100 feet approximately to connect with the existing main in Summer street, city proper. When this is laid and some changes and connections made in South Boston it will be possible to introduce the high service to that district.

As a part of the plan for a high service system in South Boston we have for the past few years laid additional mains in Congress street, A street, Mt. Washington avenue and other streets where required. These mains will be used for the low service and the existing low service mains utilized for high service. Following along this line during the past year the department laid a 16-inch main in Granite street, between Mt. Washington avenue and Baldwin street and transferred the many large connections supplying the sugar refinery from the old to the new main in anticipation of the future high service. This main will be extended during the coming year to Second street and thence to Dorchester avenue, where it will connect with the 16-inch main in that street, making a very efficient connecting line between the 20-inch Dover street South Boston supply and the 30-inch trunk line entering South Boston by way of the Congress street tunnel and Massachusetts avenue and Southampton street.

In Northern avenue advantage was taken of the new 30-inch main to lay a 12-inch distribution main connecting at two points with the same. This enabled us to establish a number of hydrants in Northern avenue and provide something like an adequate fire service, which that important district was lacking.

The construction of Old Colony avenue caused the department to lay about 2,500 feet of 12-inch main therein and connect with the Dorchester street and Dorchester avenue mains. This work was principally of value as a means of abolishing dead ends in Gustin, Lark, Cottage, E, Ames and Earl streets and equalizing the general supply in that section of South Boston.

The construction of the Charles River Embankment between Back street and the Cambridge Bridge enabled us to lay a very valuable line of 12-inch pipe, connecting with the 16-inch in Charles street and picking up the dead ends in Chestnut, Mt. Vernon, Pinckney and Revere streets. This will greatly improve the fire protection in a district that was very poorly supplied.

A similar improvement was made in the new Back Bay district bordering on the Brookline line by the laying of a 12-inch line in St. Mary's street from Beacon street to Mountfort street and picking up the dead end in Mountfort street. This district contained much valuable property that did not have proper fire protection, due to unconnected ends in a remote part of the system.

In the Longwood district bordering on the Parkway a number of buildings used as hospitals, sanatoriums and other public purposes have been erected during the last few years. By reason of small sized mains and the arrangement of the same the district could not be termed as adequately supplied for fire protection. A 10-inch main was therefore laid through Park street, from Brookline avenue to Autumn street, connecting there with a main coming from Longwood avenue by way of Riverway and Park street. The 4-inch main in Autumn street was increased to 8 inches, the 6-inch main in a part of Bellevue street was increased to 8 inches, and hydrants were established. This work will do much for the district, but in the near future the remainder of the Bellevue street main between Francis street and Brookline avenue should be relaid with larger pipe, as the district is growing and buildings of size and importance are being erected.

In Chelsea street, East Boston, about 1,500 feet of 12-inch main was replaced by 16-inch between Maverick square and Brooks street. With what was laid in 1908, there is now a continuous line of 16-inch main in Chelsea street from Maverick square to Brooks street. During the coming year it is hoped to connect the end at Brooks street with a new 30-24-inch line from Chelsea under Chelsea creek. This will bring an ample quantity of water to the southern end of the island, where it is required by reason of railroad and dock development at that end.

In Washington street, Forest Hills, there was formerly a 6-inch main in the easterly side of the square leading from Morton street and dead-ending at Tower street. This was replaced by a 16-inch main and connected with the 12-inch main in Hyde Park avenue. The 8-inch Morton street main was increased to 16 inches from Washington street to South street, where it receives its supply from the 24-inch West Roxbury main. The district in general south of Forest Hills square is thereby provided with a much improved supply.

The 6-inch main in C street, South Boston, from First street to Seventh street, was replaced by a 12-inch main. This was a very desirable piece of work, crossing the peninsula from north to south and reinforcing the many mains running east and west. Much more work of this nature will be required to thoroughly distribute the supply in South Boston.

In Norway street, between Huntington and Massachusetts avenues, the old 6-inch main was replaced by a 10-inch and 12-inch main. An improved supply in a congested section thereby results.

In Bunker Hill, Ferrin and Edgeworth streets, Charlestown, old and small sized mains were replaced with pipes of 10-inch and 12-inch diameter. The large bakery of George Fox Company in a congested section of wooden buildings was the immediate cause of this work. Its benefits, however, will be realized for some distance beyond.

The work of replacing the very old and small sized mains in Seneca, Exchange, Malcolm, Ivanhoe, Trumbull, Newland, Harris, Clark and Morton streets, Cleveland place, Greenough lane, Hanover, Franklin and Webster avenues was greatly needed. The pipes in these streets were about fifty years old and so coated with rust and the accumulated matter peculiar to cast-

iron water pipes as to be of an efficiency of less than one-half their original diameter. The water delivered by these mains was of course more or less discolored and it was because of complaints on this score that we took up the work.

A new style blow-off was used in the system the past year. It was designed by our Engineering Department and is intended to be placed upon the ends of street mains as a means of blowing off dead water. Heretofore Boston Lowry hydrants have been used for this purpose as well as for fire protection, but as it is our present policy to establish post hydrants wherever possible, Boston Lowry hydrants will not be used to the same extent as formerly. It was therefore necessary to devise a means of blowing off "dead end" mains, and the result was the new fixture called a "hydrant blow-off." It consists of a piece of 3-inch iron pipe, to be set vertically in a well or box, the top of which is flush with the surface of the street. The lower end of the pipe approaches the horizontal plane of the street main by means of a long easy curve. A 3-inch flanged gate valve is bolted to the end of the curve and the end of the street main enters the bell of the gate valve. If the street main is larger than 3 inches, reducers are used. A $2\frac{1}{2}$ -inch hose nipple is fitted into the upper end of the 3-inch pipe and a cap is screwed on to this nipple when not in use. When in use the female end of a $2\frac{1}{2}$ -inch fire hose coupling is connected with the nipple, and the 3-inch gate valve is operated by a gate wrench. The water is blown off through the hose into sewer, catch-basin or wherever convenient. No chuck is used as in the case of a Boston Lowry hydrant and the flow is much freer by reason of the easy curve.

Eighty-three petitions for main pipe to be laid in various streets were investigated and the required lengths measured, and seventy-five petitions were granted and the pipe laid.

COST OF MAIN PIPE LAYING.

The following statements will show in tabulated and classified form the cost of main pipe laying during the year. The first table shows the prices upon which the costs are based, and the second table gives the costs of the work classified by sizes, nature of work

Tabulated and Classified Statement Showing in Detail the Cost of Main Pipe Laying During the Year 1909-10.

NATURE OF WORK.	Diameter of Pipe Laid.	Length Laid (Feet.)	COST PER LINEAR FOOT OF VARIOUS ELEMENTS OF WORK.										REMARKS.	
			Main Pipe.	Specials, Valves and Boxes.	Lead and Gasket.	Department Labor and Inspection.	Contract Labor.	Teaming.	Hydrant Cost.	Repaving.	Service Pipe Stock.	Miscellaneous.		Total.
New mains . . .	2-inch . . .	89	\$0 551	\$0 108	.....	\$0 130	.....	\$0 049	.....	.....	.....	.....	\$0 84	Department work; uncongested section, lead pipe, excavation partly done by Sewer Division.
New mains . . .	6-inch . . .	800	\$0 352	\$0 251	\$0 052	\$0 176	.....	\$0 053	\$0 134	.....	.....	\$0 010	\$1 632	Department work; no obstructions over or under ground. Conditions good.
New mains . . .	6-inch . . .	74	.178	.780	.139	3.517	.....	.577	.....	\$1 281	.....	.175	6 650	Department work; business section, pavement, narrow street, congestion over and under ground. Cold and stormy weather, frost in ground. Very unfavorable conditions.
New mains . . .	6-inch . . .	296	.398	.253	.077	.116	\$0 518	.041	.....	.....	.....	.010	1 415	Contract work; no obstructions over or under ground. Conditions generally good.
		1,170	\$0 353	\$0 285	\$0 064	\$0 783	\$0 131	\$0 083	\$0 001	\$0 081	.....	\$0 021	\$1 894	Average cost of total 6-inch new mains.
New mains . . .	8-inch . . .	319	\$0 588	\$0 135	\$0 061	\$0 890	.....	\$0 042	.....	\$0 355	.....	\$0 041	\$2 113	Department work; business section, block pavement, much congestion over and under ground. One of two lines laid in same trench. Labor item less on that account.
New mains . . .	8-inch . . .	1,692	.563	.253	.073	.801	.....	.083	\$0 358	.....	.....	.030	2 163	Department work; uncongested section. Conditions good.
New mains . . .	8-inch . . .	148	.571	.031	.074	1.323	.....	.150	.487	.....	.....	.022	2 661	Department work; uncongested section; very hard digging. Considerable soft rock.
New mains . . .	8-inch . . .	575	.562	.223	.085	2.282	.....	.115	.520	.....	.....	.026	3 816	Department work; rock. Otherwise good conditions.
New mains . . .	8-inch . . .	329	.554	.272	.100	1.615	.....	.228	.690	.....	.....	.056	3 426	Department work; uncongested sections; cold weather, frost in ground; small jobs averaging 55 feet each.
New mains . . .	8-inch . . .	7,977	.575	.237	.083	.088	\$0 531	.061	.267	.....	.....	.013	1 857	Contract work; uncongested section. Conditions good.
New mains . . .	8-inch . . .	3,748	.584	.179	.073	.110	.061	.050	.212	.....	.....	.012	2 183	Contract work; uncongested section; rock. Conditions otherwise good.
		14,788	\$0 575	\$0 220	\$0 079	\$0 324	\$0 529	\$0 067	\$0 277	\$0 067	.....	\$0 016	\$2 100	Average cost of total 8-inch new mains.
New mains . . .	10-inch . . .	345	\$0 751	\$0 345	\$0 065	\$0 793	.....	\$0 108	\$0 316	.....	.....	\$0 014	\$2 395	Department work; uncongested section. Conditions good.
New mains . . .	10-inch . . .	691	.783	.273	.072	1.242	.....	.051	.217	.....	.....	.032	2 075	Department work; uncongested section; cold weather, frost in ground.
New mains . . .	10-inch . . .	139	.706	.705	.158	2.172	.....	.132	.....	.....	.....	.121	3 996	Department work; uncongested section; interference from building operations.
New mains . . .	10-inch . . .	209	.667	.462	.153	1.822	.....	.153	.....	\$0 841	.....	.075	4 271	Department work; business section; expensive pavement; congestion over and under ground, over-time work; branches for prospective services inserted. Conditions unfavorable.
New mains . . .	10-inch . . .	4,244	.770	.257	.075	.065	\$0 523	.058	.174	.....	.....	.011	1 937	Contract work; uncongested section. Conditions good.
New mains . . .	10-inch . . .	1,368	.771	.168	.083	.079	.963	.068	.124	.....	.....	.013	2 272	Contract work; uncongested section, rock. Conditions otherwise good.
		6,995	\$0 767	\$0 261	\$0 080	\$0 317	\$0 505	\$0 066	\$0 167	\$0 025	.....	\$0 015	\$2 209	Average cost of total 10-inch new mains.
New mains . . .	12-inch . . .	486	\$0 930	\$0 096	\$0 089	\$1 151	.....	\$0 129	\$0 575	.....	.....	\$0 021	\$2 936	Department work; uncongested section. Conditions good.
New mains . . .	12-inch . . .	981	.919	1 021	.211	2.653	.....	.146	.661	\$0 990	.....	.089	5 402	Department work; business section; block pavement; car rails; generally congested. Unfavorable conditions.
New mains . . .	12-inch . . .	2,067	.680	.263	.....	.625	\$0 666	.....	.475	.093	.....	.....	2 144	Contract work; uncongested section; block pavement; conditions good; contractor furnished teaming, lead, gasket, etc., and made connections.
New mains . . .	12-inch . . .	7,491	1 012	.200	.104	.655	.427	.053	.328	.....	.....	.010	2 191	Contract work; uncongested section. Conditions good.
New mains . . .	12-inch . . .	462	.982	.211	.115	.692	.586	.102	.115	.....	.....	.006	2 373	Contract work; uncongested section; rock. Conditions otherwise good.
		11,427	\$0 941	\$0 268	\$0 096	\$0 270	\$0 425	\$0 058	\$0 333	\$0 101	.....	\$0 015	\$2 508	Average cost of total 12-inch new mains.
New mains . . .	16-inch . . .	178	\$1 467	\$0 157	\$0 166	\$1 339	.....	\$0 183	\$0 443	.....	.....	\$0 029	\$3 787	Department work; uncongested section; complicated with services. Conditions good otherwise.
New mains . . .	16-inch . . .	118	1 361	.215	.151	1.477	.....	.126	.....	\$0 840	.....	.015	4 188	Department work; business section; pavement; congestion over and under ground. Conditions bad.
New mains . . .	16-inch . . .	422	1 512	.571	.233	4.104	.....	.193	.....	.....	.....	1 852	8 472	Department work; laid on treble over water and housed with double box; pipes strapped; box painted, air and drip-cocks established, tunnel and shafts pumped out; unusual and extraordinary job done under most unfavorable conditions.
New mains . . .	16-inch . . .	43	1 525	2 660	.....	.241	\$0 770	.....	.....	.....	.....	.....	5 206	Contract work; uncongested section; conditions good; contractor furnished teaming, lead, gasket, etc.
New mains . . .	16-inch . . .	1,127	1 532	.479	.152	.965	.680	.185	.537	.432	\$0 358	0 045	5 361	Contract and department work; business section; congestion overground, block pavement; many service and fire pipes of large diameter encountered; the same lowered or connected with new main; hydrant also transferred to new main; branch openings in old main made up with straight pipe. Water service maintained for consumers; extra gates inserted in line; large brick gate chamber built. Unusual job, involving many difficulties. Department work done mostly during cold weather with frost in ground.
		1,918	\$1 568	\$0 499	\$0 165	\$1 468	\$0 416	\$0 166	\$0 357	\$0 319	\$0 210	\$0 289	\$5 491	Average cost of total 16-inch new mains.

Tabulated and Classified Statement Showing in Detail the Cost of Main Pipe Laying During the Year 1909-10.—Continued.

NATURE OF WORK	Diameter of Pipe Laid.	Length Laid. (Feet.)	COST PER LINEAR FOOT OF VARIOUS ELEMENTS OF WORK.										REMARKS.	
			Main Pipe.	Specials, Valves and Boxes.	Lead and Gasket.	Department Labor and Inspection.	Contract Labor.	Teaming.	Hydrant Cost.	Repaving.	Service Pipe Stock.	Miscellaneous.		Total.
New mains.....	24-inch....	377	\$2.805	\$1.438	\$0.258	\$1.772	.....	\$0.232	.....	.....	.....	\$2.125	\$11.631	Department work; laid on trestle over water and housed with double box; pipes strapped; box painted, air and drip-cocks established; tunnel and shafts pumped out; unusual and extraordinary job done under most unfavorable conditions.
New mains.....	30-inch....	711	\$3.945	\$1.312	\$0.593	\$1.514	.....	\$0.180	.....	\$1.355	.....	\$0.846	\$13.050	Department work; business section; expensive pavement; car rails; great congestion over and under ground, old stone sea wall of about 50 cubic yards taken apart and removed, mains to three side streets lowered; sewer connections temporarily removed; wire conduits and manholes encountered; ingress and egress to and from abutting buildings maintained throughout the work. An extraordinarily difficult job.
New mains.....	30-inch....	5,767	1.209	0.292	.....	0.065	1.982	0.007	.....	0.347	.....	0.018	6.924	Contract work; uncongested section, pavement, dock mud, ground water, loose soil. Conditions hardly favorable. Contractor hauled pipe and supplied lead, gasket, blocking, etc.
		6,478	\$1.180	\$0.404	\$0.065	\$0.553	\$1.765	\$0.059	.....	\$0.458	.....	\$0.109	\$7.596	Average cost of total 30-inch new mains.
New mains.....	36-inch....	313	\$5.795	.....	\$0.257	\$0.330	\$1.684	\$0.227	.....	.....	.....	\$0.431	\$11.781	Contract work; uncongested section. Conditions good.
Replacement of old mains.	6-inch.....	55	\$0.411	\$1.192	\$0.246	\$1.613	.....	\$0.131	.....	.....	.....	\$0.030	\$3.621	Department work; uncongested section. Cold weather, frost in ground.
Replacement of old mains.	6-inch.....	1,554	.348	.157	.061	.218	\$1.184	.041	\$0.170	\$1.317	\$0.106	.013	3.619	Contract work; greatly congested district, unusually narrow streets, expensive pavement, many service connections, unfavorable conditions.
		1,612	\$0.350	\$0.195	\$0.068	\$0.268	\$1.141	\$0.044	\$0.164	\$1.270	\$0.102	\$0.013	\$3.019	Average cost of total 6-inch replacement.
Replacement of old mains.	8-inch.....	151	\$0.593	\$0.121	\$0.088	\$1.110	.....	\$0.083	.....	.....	\$0.035	\$0.040	\$2.077	Department work; uncongested section. Conditions good.
Replacement of old mains.	8-inch.....	306	.251	.362	.097	.985	.....	.072	\$0.482	.....	.024	.017	2.293	Department work; uncongested section. Cold weather, frost in ground.
Replacement of old mains.	8-inch.....	613	.516	.289	.082	1.192	.....	.106	.101	\$0.511	.089	.037	3.227	Department work; greatly congested section, many service connections, unusually narrow streets, expensive pavement; overtime necessary. Generally unfavorable conditions.
Replacement of old mains.	8-inch.....	1,206	.486	.227	.080	.146	\$0.573	.067	.129	.....	.033	.014	1.759	Contract work; uncongested section. Conditions good.
Replacement of old mains.	8-inch.....	1,601	.514	.324	.115	.190	.074	.068	.191	.023	.086	.019	3.107	Contract work; greatly congested section; many service connections, unusually narrow streets, expensive pavement. Generally unfavorable conditions.
		3,577	\$0.488	\$0.283	\$0.097	\$0.151	\$0.580	\$0.074	\$0.173	\$0.335	\$0.063	\$0.021	\$2.602	Average cost of total 8-inch replacement.
Replacement of old mains.	10-inch....	172	\$0.315	\$0.450	\$0.114	\$1.350	.....	\$0.064	.....	.....	.....	\$0.069	\$2.364	Department work; business section, congestion above and under ground, pavement and overtime work.
Replacement of old mains.	10-inch....	350	.590	.456	.086	1.069	.....	.080	\$0.113	\$0.088	\$0.082	.020	2.586	Department work; uncongested section, many service connections, pavement. Conditions otherwise good.
Replacement of old mains.	10-inch....	46	.528	.462	.149	1.505	.....	.043	.....	.....	.018	.012	2.719	Department work; uncongested section, cold weather, frost in ground. Conditions otherwise good.
Replacement of old mains.	10-inch....	130	.573	1.083	.215	1.937	.....	.107	.656	.....	.030	.139	4.745	Department work; uncongested section, many special castings inserted. Conditions otherwise good.
Replacement of old mains.	10-inch....	2,004	.665	.385	.122	.109	\$0.588	.077	.119	.....	.039	.015	2.123	Contract work; uncongested section. Conditions good.
Replacement of old mains.	10-inch....	1,328	.706	.350	.108	.195	.851	.057	.365	.325	.099	.020	3.079	Contract work; business section, many service connections, pavement, car rails; congestion over and under ground. Conditions generally unfavorable.
Replacement of old mains.	10-inch....	186	.634	1.987	.279	.094	.577	.075	.....	.202	.....	.023	3.271	Contract work; uncongested section, many special castings inserted, pavement. Conditions otherwise good.
		4,210	\$0.627	\$0.476	\$0.124	\$0.336	\$0.573	\$0.071	\$0.200	\$0.118	\$0.055	\$0.023	\$2.611	Average cost of total 10-inch replacement.
Replacement of old mains.	12-inch....	162	\$0.676	\$2.077	\$0.370	\$2.055	.....	\$0.240	\$0.961	\$1.883	.....	\$0.064	\$5.958	Department work; short jobs, business section, pavement, congestion over and under ground, many special castings inserted. Conditions unfavorable.
Replacement of old mains.	12-inch....	1,143	.932	.734	.184	.223	\$0.785	.123	.462	.112	\$0.068	.026	3.670	Contract work; business section, many services, pavement, car rails. Conditions generally unfavorable.
Replacement of old mains.	12-inch....	1,997	.885	.380	.066	.374	.699	.099	.147	.235	.081	.037	3.006	Contract and department work; uncongested section, pavement, many services and sub connections. Cold weather during part of job, frost in ground. Contractor failed to finish job. Trench had to be kept safe during winter.
		3,302	\$0.898	\$0.586	\$0.120	\$0.434	\$0.694	\$0.114	\$0.296	\$0.274	\$0.072	\$0.036	\$3.528	Average cost of total 12-inch replacement.



Tabulated and Classified Statement Showing in Detail the Cost of Main Pipe Laying During the Year 1909-10.—Concluded.

NATURE OF WORK.	Diameter of Pipe Laid.	Length Laid. (Feet.)	COST PER LINEAR FOOT OF VARIOUS ELEMENTS OF WORK.										REMARKS.	
			Main Pipe.	Specials, Valves and Boxes.	Lead and Gasket.	Department Labor and Inspection.	Contract Labor.	Teaming.	Hydrant Cost.	Repaving.	Service Pipe Stock.	Miscellaneous.		Total.
Replacement of old mains.	16-inch....	1,013	\$1 423	\$0 221	\$0 070	\$1 609	.....	\$0 204	\$0 292	\$0 371	\$0 136	\$0 033	\$4 360	Department work; uncongested section, pavement. Cold weather, frost in ground. Many services and other connections. Cleaning up on unfinished contract work.
Replacement of old mains.	16-inch....	1,401	1 336	.659	.181	.109	\$0.407	.158	.274	.....	.050	.017	3 200	Contract work; uncongested section. Conditions generally good.
Replacement of old mains.	16-inch....	68	359	4 113	.346	.257	.580	.057	.....	.663	.....	.022	6 297	Contract work; uncongested section, pavement. Conditions good.
		2,482	\$1 348	\$0 575	\$0 110	\$0 725	\$0 245	\$0 174	\$0 274	\$0 166	\$0 084	\$0 024	\$3 760	Average cost of total 16-inch replacement.
Mains relocated....	4-inch....	10	\$0 075	\$0 611	\$0 157	\$0 766	.....	\$0 283	.....	.....	.....	\$0 142	\$2 064	Department work; excavation and backfilling by Sewer Division. Short job.
Mains relocated....	6-inch....	99	\$0 377	\$1 029	\$0 338	\$0 754	.....	\$0 245	.....	.....	.....	\$0 096	\$2 840	Department work; excavation and backfilling done by Sewer Division, gas company and others. Short job.
Mains relocated....	6-inch....	45	.217	.958	.295	1 492	.....	.077	.....	.....	\$0 407	.061	3 510	Department work; excavation and backfilling done partly by department and partly by Sewer Division at Water Department's expense; considerable congestion.
		144	\$0 327	\$1 097	\$0 324	\$0 985	.....	\$0 192	.....	.....	\$0 127	\$0 085	\$3 050	Average cost of total 6-inch relocation.
Mains relocated....	8-inch....	138	\$0 166	\$0 685	\$0 246	\$0 483	.....	\$0 142	.....	.....	\$0 044	\$0 061	\$1 890	Department work. Excavation and backfilling done by Boston Transit Commission, Sewer Division and others.
Mains relocated....	8-inch....	127	.566	.327	.164	.464	\$0 969	.045	.....	.....	.153	.021	2 710	Contract and department work; some congestion and a few other minor difficulties.
Mains relocated....	8-inch....	176	.159	.....	.033	.714	1 648	.209	\$0 428	.....	.153	.016	3 382	Contract and department work; uncongested section, rock; generally unfavorable condition.
		441	\$0 278	\$0 305	\$0 145	\$0 570	\$0 936	\$0 140	\$0 170	.....	\$0 110	\$0 032	\$2 493	Average cost of total 8-inch relocation.
Mains relocated....	10-inch....	280	\$0 646	\$0 814	\$0 233	\$0 582	.....	\$0 110	\$0 155	.....	\$0 020	.064	\$2 626	Department work; excavation and backfilling done by Boston Transit Commission, Sewer Division and others; work involved with building of Beacon Hill tunnel; delays and obstruction thereby.
Mains relocated....	10-inch....	355	.745	.554	.139	1 511	.....	.062	.453	\$0 594	.139	.047	4 228	Department work; pavement, car rails; congestion underground.
Mains relocated....	10-inch....	109	.490	.721	.248	2.883	.....	.162	.....	.....	.....	.122	4 615	Department work; business section; much congestion over and under ground; overtime work; conditions unfavorable.
Mains relocated....	10-inch....	670	.742	.375	.123	.322	.954	.091	.183	.....	.611	.034	3 425	Department and contract work; uncongested section, Sewer Division at work in street; work done in instalments; many difficulties encountered; very unfavorable condition.
		1,414	\$0 694	\$0 533	\$0 155	\$0 870	\$0 452	\$0 088	\$0 231	\$0 149	\$0 326	\$0 050	\$3 562	Average cost of total 10-inch relocation.
Mains relocated....	12-inch....	14	.....	\$1 200	\$0 260	\$1 093	.....	\$0 150	.....	.....	.....	\$0 150	\$2 866	Department work; uncongested section, cold weather, frost in ground.
Mains relocated....	12-inch....	364	\$0 534	1 452	.380	1 265	.....	.192	.....	.....	.....	.120	3 945	Department work; excavation and backfilling done by Sewer Division and others; delay caused in some of the jobs by waiting for excavation, overtime rates paid in other jobs.
Mains relocated....	12-inch....	247	.903	.196	.112	.143	\$0 401	.075	\$0 864	.....	\$0 313	.036	3 106	Contract work; uncongested section; done in connection with laying of 36-inch main, many service connections and much work done therewith.
Mains relocated....	12-inch....	732	.090	.039	.069	1 470	.565	.157	.146	.....	.042	.102	2 983	Contract and department work; uncongested section, rock; pipe lowered; services reconnected and relaid, very hard job, interference from other work in progress at same time.
Mains relocated....	12-inch....	142	1 123	1 189	.401	.897	1 895	.300	.....	.....	.111	.231	6 159	Contract and department work; congestion over and under ground; interference from other work in progress.
		1,519	\$0 424	\$0 521	\$0 183	\$1 145	\$0 680	\$0 166	\$0 213	.....	\$0 082	\$0 108	\$8 530	Average cost of total 12-inch relocation.
Mains relocated....	16-inch....	119	\$1 450	\$0 211	\$0 177	\$1 785	.....	\$0 185	.....	.....	.....	\$0 064	\$3 873	Department work; partly in earth, partly on bridge over railroad, dangerous; slow and careful movements necessary.
Mains relocated....	16-inch....	485	1 396	1 162	.323	.513	.....	.104	.....	.....	\$0 008	.069	3 877	Department work; excavation and backfilling done by Sewer Division, delay caused by waiting for excavation.
		604	\$1 466	\$0 975	\$0 294	\$1 065	.....	\$0 120	.....	.....	\$0 006	\$0 068	\$3 877	Average cost of total 16-inch relocation.
Mains relocated....	24-inch....	122	\$1 997	\$0 575	\$0 271	\$1 741	.....	\$0 181	.....	.....	.....	\$0 059	\$1 736	Department work; partly in earth, partly on bridge, over railroad, dangerous; slow and careful movements necessary.
Mains relocated....	24-inch....	35	\$2 013	\$11 772	\$0 605	\$6 355	.....	\$0 181	.....	.....	.....	\$2 132	\$33 060	Department work; assisted somewhat by Boston Elevated Railway Company, on whose account work was done; overtime rates paid; working in rails delayed by Boston Elevated Railway Company; 24-inch gate established and abandoned, condition generally unfavorable.



and conditions obtaining. Incidental expenses, such as supervision, clerical work, holidays, injuries to men, tools, cost of plant, depreciation, interest on money invested, etc., are not included in these costs. They represent the direct cost of the work with the exception of articles manufactured in the shop and the teaming. Those items include an additional amount covering the immediate incidental expenses in the shop and stable respectively.

In grouping the jobs with reference to conditions considerable generalization had to be made. A broad standard had to govern the selection for the various groups, as otherwise the subdivision would be almost interminable. This can readily be understood when one considers the variety of conditions encountered in underground work and the modifications of the same in different jobs.

Much apparently unwarranted variation in costs is encountered in a study of the table, but in every case there is an explainable and reasonable cause.

One of the disturbing factors in the ratio of costs with stated conditions is the number of special castings used. The more special castings (gates, valves, branches, offsets, curves, sleeves, blow-offs, etc.) there are in a given length of main the greater the cost of labor, lead, teaming and miscellaneous per foot.

Short lengths of main as a rule cost proportionately more per foot than long lengths.

In contract work the variable prices bid by successful bidders are disturbing factors. Two sets of bids on two different jobs where conditions are practically alike will vary to a considerable extent.

As the department makes the connections in contract work and as the cost of the connection work varies in accordance with the number and difficulty of the same, the proportion of increase or decrease in the cost per foot is thereby varied.

The item of old pipe taken from the ground in replacement and relocation work is a considerable factor in reducing the cost per foot of main pipe and lead used, inasmuch as its value as junk and in some cases as good pipe is credited against the cost of the new pipe used, and the old lead joints recovered from the old pipe are remelted and used to run the joints in the new work. On the other hand, the labor item is increased by reason of the breaking and handling and loading of the old pipe.

The more hydrants there are included in a job the greater the cost per foot of the main pipe labor, inasmuch as the fitting of hydrant branches into the line causes cutting of pipe, extra joints, etc., and although the hydrant is supposed to bear this extra cost, yet it is difficult to correctly separate it from the main pipe work.

Service pipe connections in replacement and relocation work are a very important influence in the cost of jobs. They introduce the plumber, helper and driller into the work with their attendant expense. Service pipe fittings and variable lengths of lead pipe also add to the cost, also extra digging and delay in backfilling.

The foregoing are some of the causes that produce an irregular scale of costs in the work. Sometimes they appear singly in a job and sometimes several are found in the same job, operating in conflict with each other and against favorable factors that may also exist in the same job. The effect is to neutralize either the good or bad conditions and produce costs different from what the salient factors of the job lead us to expect. These factors, which are present in all jobs, are the size of pipe, whether it is a new main, replacement or relocation, the nature of the soil, the amount of congestion under and over the surface, the weather and the kind of pavement to be replaced.

Prices upon which Costs of Main Pipe Laying are Based.

Main pipe, 3-inch to 12-inch, inclusive, at	\$0.01165 lb.
“ 16-inch to 24-inch, inclusive, at . . . . .	.0115 lb.
“ 30-inch to 60-inch, inclusive, at . . . . .	.0118 lb.
“ specials, small, at . . . . .	.0258 lb.
“ “ large, at . . . . .	.025 lb.
Air valves, 1-inch, at	2.08 each.
“ 1½-inch, at	4.82 each.
“ 2-inch, at	6.91 each.
Gate valves, 3-inch, at	12.82 each.
“ 3-inch (B. O.), at	14.82 each.
“ 4-inch, at	15.95 each.
“ 6-inch, at	22.55 each.
“ 6-inch (B. P.), at	25.42 each.
“ 8-inch, at	30.14 each.
“ 10-inch, at	50.46 each.
“ 12-inch, at	57.77 each.
“ 16-inch, at	104.89 each.
“ 20-inch, at	297.29 each.
“ 24-inch, at	328.27 each.
“ 30-inch (with 6-inch by-pass), at	564.37 each.
“ 36-inch (with 6-inch by-pass), at	806.28 each.

Hydrant barrels, Boston post, at	\$49.82 each.
“ “ ordinary post, at	44.78 each.
“ “ Boston Lowry, at	23.28 each.
“ “ Lowry, at	28.37 to 32.49 each.
“ specials, at . . . . .	.0258 lb.
Gate valve boxes, small, concrete, at	6.22 each.
“ “ “ iron, at	5.28 to 7.78 each.
“ “ “ wood, at	3.73 each.
“ “ large, wood, at	4.68 each.
Hydrant boxes, post, concrete, at	6.21 each.
“ “ “ wood, at	4.19 each.
“ “ Boston Lowry, wood, at	6.11 each.
“ “ Lowry, concrete, at	6.41 each.
“ “ “ wood, at	4.40 each.
Box frames and covers, at . . . . .	.022 lb.
Pig lead, at (average) . . . . .	.04385 lb.
Lead pipe, at . . . . .	.0437 to .0532 lb.
Gasket or yarn, at . . . . .	.06 lb.
Blocking, at . . . . .	.02 foot*
Lumber, at (average)	27.00 M. feet.*
Clay, at . . . . .	.0032 lb.
Firewood, at . . . . .	.77 foot.
Cartage, short haul (2½ miles), at . . . . .	.75 ton.
Cartage, long haul (2½ miles), at	1.40 ton.
Single team (department), at	5.00 day.
Double team (department), at	7.00 day.
“ (hired), at	5.50 and 6.00 day.
Laborers, at	2.25 day.
Calkers, at	2.25 and 2.50 day.
Pipe layers, at	2.50 day.
Plumbers, at	3.00 day.
Drillers, at	2.25 and 2.75 day.
Foreman, at	3.00 day.
Inspectors, at	2.75 and 3.00 day.
Cost of block paving with gravel bed and joints . . . . .	.65 sq. yd.
“ “ “ concrete base and pitch joints	2.90 and 3.25 sq. yd.
Cost of asphalt paving	3.25 and 3.50 sq. yd.
“ wooden block paving with concrete base and cement joints	5.00 sq. yd.

Exclusive of the main pipe work covered in the preceding table, the following gate valves, air valves and blow-offs were established, the valves on old mains and the blow-offs on the ends of new mains:

Gate Valves.

4 16-inch, at total cost of	\$743 83
15 12 “ “ “	1,564 31
4 8 “ “ “	242 77
6 6 “ “ “	303 75
1 4 “ “ “	47 06

Air Valves.

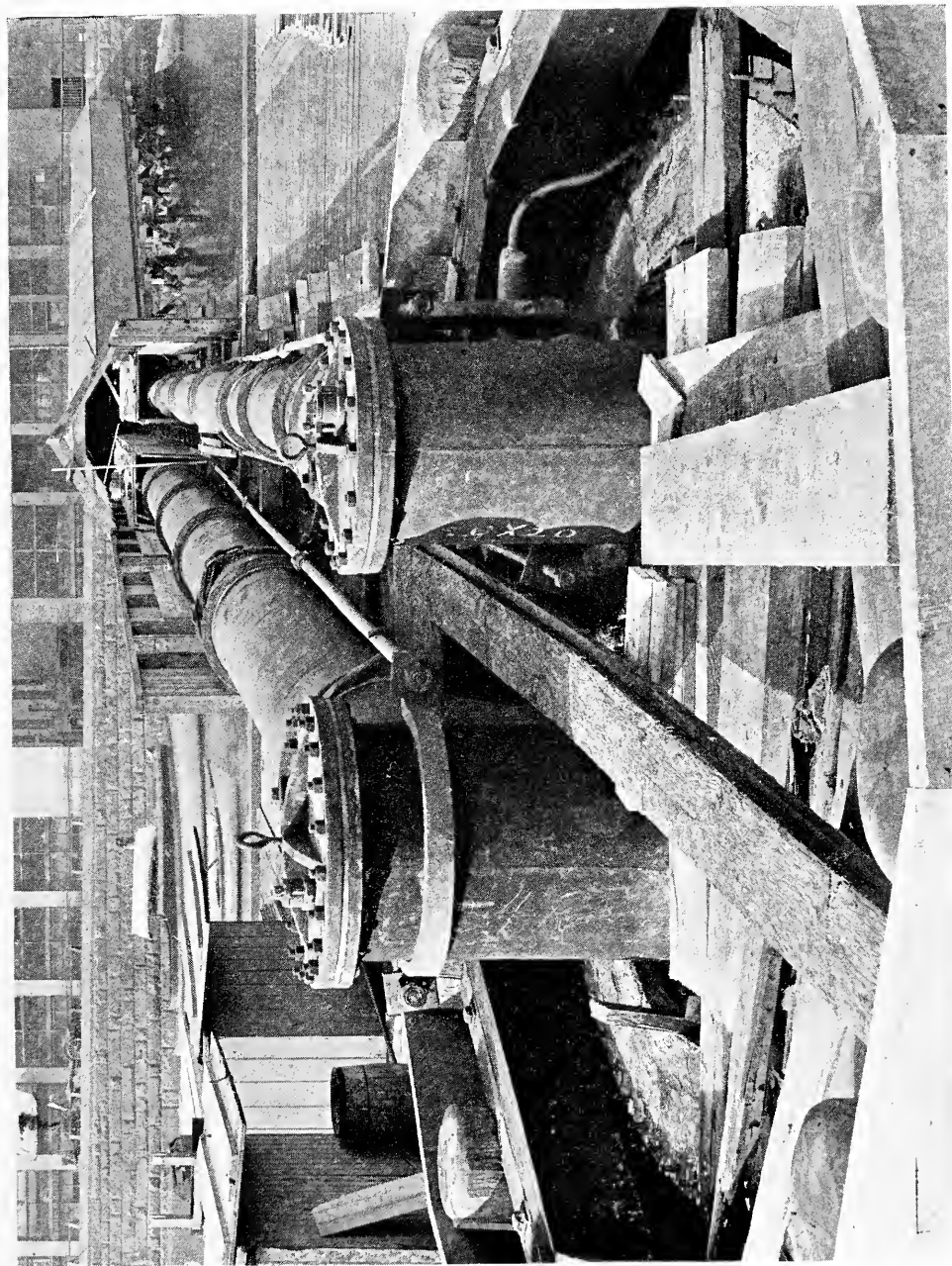
1 1½-inch, at total cost of	\$21 49
1 2 “ “ “	39 09

* Board measure.

Blow-offs.

1	3-inch	on 12-inch main at total cost of	.	.	.	.	.	.	\$50 10
7	3	" " 8 " " " "	.	.	.	.	.	.	357 56
6	3	" " 6 " " " "	.	.	.	.	.	.	364 55
1	3	" " 4 " " " "	.	.	.	.	.	.	57 43
1	1	" " 8 " " " "	.	.	.	.	.	.	20 17

The most expensive job per foot performed by the department during the year was the laying of the 16-inch and 24-inch lines upon the pipe trestle at Congress street tunnel and the 30-inch line from the trestle to Atlantic avenue. The conditions were extremely difficult. It was necessary to roll the pipes upon the trestle one by one. They were jointed a few at a time, and great care with slow movements on the part of the men were necessary because of the limited space and dangerous situation. Both lines of pipe were tied to the manhole branches in the shaft openings with 1½-inch and 2-inch Bessemer steel rods joined with turn-buckles. The tops of the manhole branches were flanged and the cover plates were bolted to the flanges with sheet lead packing. The bolts were red-leaded. Air valves were placed in the cover plates, and 2½-inch hose nipples with caps screwed on were inserted in the cover plate of each branch to permit of pumping out the siphons to a point below the salt water line, if deemed necessary. The vertical pipes in the shafts are also tied with rods and turn-buckles from the manhole branches at top to the curves at the bottom of the shaft where the pipes enter the tunnel. These rods had become detached and it was necessary before letting the water into the pipes to make them fast. It was also considered desirable to observe the joints for leaks when the water was turned into the pipes. To do this the salt water which had percolated into the tunnel and filled it and the shafts to a point within a few feet of the shaft openings had to be removed. This was quite a job, inasmuch as the shafts are 63 feet deep and 7 feet 4 inches in diameter and the tunnel is 112 feet long and 8 feet in diameter. After many small difficulties were overcome the water was removed by means of a No. 5 pulsometer pump. The steam to operate the same was generated by an upright portable boiler set upon the bridge pier near the westerly shaft. The pulsometer was suspended by a tripod and lowered as the water receded in the shaft, the steam pipe



24-INCH LOW SERVICE AND 16-INCH HIGH SERVICE LINES CROSSING PIPE TRESTLE AT CONGRESS STREET TUNNEL AND ENTERING SHAFT OF TUNNEL. HOUSING OF PIPES PARTIALLY CONSTRUCTED. (See Page 46.)

and discharge hose being lengthened correspondingly. The weather was very cold and it was difficult to maintain a sufficient head of steam in the pulsometer, due to radiation in the long length of steam pipe from the boiler to the pulsometer down near the bottom of the shaft. The discharge and suction connections had to be absolutely air-tight and every assistance given the pump under the trying conditions. A few leaking joints were discovered and easily repaired by calking. The two lines on the trestle were housed by a double box with pitched roof. This was a somewhat extensive job and beyond the capacity of our carpenter shop. Extra help was furnished by C. H. Belledue, carpenter contractor, on a day labor basis. The box is about 413 feet long, $8\frac{1}{2}$ feet wide and 4 feet high to the eaves and $6\frac{1}{2}$ feet to the ridgepole. Suitable coverings were built over the shafts. The entire structure was given two coats of paint.

In laying the pipe from the trestle to Atlantic avenue by way of Dorchester avenue and Congress street all kinds of adverse conditions were encountered. The locality is a very busy one and the great amount of teaming, together with the accommodation given to the occupants of buildings along the line, tended to delay us and prevented economical methods in executing the work. Tide water, conduits, sewer connections, catch-basins, old timbers, manholes and a large sea wall of heavy granite blocks lay in our path. There were about 75 cubic yards of granite in the sea wall. The blocks had to be cut so as to handle them and were removed piecemeal. The dock timbers were large and tough. The sewer connections were many and had to be broken and relaid at suitable grades to admit the laying of our pipes. The work had to be done when there was the least amount of discharge from the buildings, some of which were occupied by manufacturers employing large numbers of help. Water mains crossing the line of the pipe had to be raised or lowered and when we approached the middle of Atlantic avenue we were obliged to offset both ways because of manholes and junction boxes that could not very easily be moved. The job with its continual obstruction impresses one with the trying conditions to be met with in laying a large sized main through the city's congested streets.

MAINTENANCE OF MAIN PIPE.

Following is a table showing the nature of the work, the number of times the work was done and the cost:

NATURE OF WORK.	Number of Jobs.	Cost of Material.	Cost of Labor, Teaming and Car Fares.	Total Cost.
Leaking joints repaired.....	148	\$367 66	\$1,977 80	\$2,345 46
Leaks due to settlement and other causes repaired.....	25	280 26	1,806 86	2,087 12
Repairs caused by operations of Sewer and Street Departments, Boston Consolidated Gas Company and other corporations.....	18	63 89	297 61	361 50
Pipes on bridges repaired and reinforced,	3	258 43	535 17	793 60
Gate valves renewed	6	550 98	260 28	811 26
Gate valves repaired.....	50	200 66	519 28	719 94
Gate valves repacked.....	271	11 78	470 71	482 49
Gate valves marked.....	1,971	2 10	325 45	327 55
Gate valves inspected and tested.....	4,861	25 22	3,625 78	3,651 00
Gate valve boxes renewed.....	270	1,537 19	2,269 79	3,806 98
Gate valve boxes repaired.....	79	53 42	284 19	337 61
Gate valve boxes raised and lowered...	452	316 25	1,244 62	1,560 87
Gate valve boxes cleaned out.....	1,577	.....	1,434 20	1,434 20
Gate valve boxes inspected.....	33	.....	6 75	6 75
Gate valve box covers cleaned off.....	2,003	.....	228 13	228 13
Gate valve box covers salted	5,947	161 43	973 67	1,135 10
Frames and covers renewed.....	39	86 95	146 09	233 04
Streets repaved (including contractor's work).....	402	738 85	6,266 75	7,005 60
Dead end blown off.....	1,363	7 18	904 20	911 38
Bridge boxes painted.....	35	281 61	475 67	757 28
Bridge boxes repaired.....	43	432 64	923 81	1,356 45
Brick chambers, two built and two repaired.....	4	67 67	313 25	380 92
High service lines tested.....	1	.....	9 07	9 07
Abandoned blow-off removed.....	1	.....	15 32	15 32
Sign posts erected for marking gate valve locations.....	14	9 68	93 39	103 07
Siphons pumped out.....	2	.....	91 50	91 50
Main pipes located.....	3	.....	26 88	26 88
Signs on islands repaired and painted...	7	127 81	275 97	403 78
Gate valve boxes abandoned and filled in,	3	.....	21 60	21 60
Totals.....	.....	\$5,581 66	\$25,823 79	\$31,405 45



BREAK IN 30-INCH MAIN, TREMONT STREET, OPPOSITE SEAVER PLACE, JANUARY 3, 1910; REPAIRED BY PIECE OF PIPE AND TWO SLEEVES. ON THE LEFT IS SEEN ROOF OF SUBWAY AND WESTERLY 30-INCH MAIN RESTING UPON IT. EDISON CABLES AND DUCTS ARE SUSPENDED OVER EASTERLY MAIN. (See Page 49.)

It will be seen in the foregoing table that the total cost of main pipe repairs and maintenance for the year was \$31,405.45, an amount considerably in excess of that for the year previous. This may be accounted for by the unusually large cost of repaving streets, renewing, regulating and repairing gate valve boxes, the maintenance of pipes on bridges and the expensive leaks that occurred during the year.

It is to be expected that as the system grows older the maintenance item will increase accordingly. In addition to this is the fact that repairs are yearly increasing in cost by reason of increasing congestion under and over the surface, the high class of pavement to be encountered and replaced and the more exacting demands of the public, to whom deference must be given in the matter of shutting off water and interfering with street traffic; overtime work with a greater wage cost results in the one case and delay in the other.

During the past year a large amount of repaving was done in the downtown section where this department had made openings. In most of the cases the openings had been made in previous years, but the burden of cost is placed upon the year just passed. Although the department has three patch paving gangs it is necessary to let out much of the work to contractors. The large number of boxes that are in the streets are a cause of much expense. As most of them are made of wood they are continually deteriorating and as a matter of safety have to be renewed. We are substituting concrete boxes in most cases and before long we hope to realize good results in a lessened number of decayed boxes.

The work of the Street Department is a source of expense to this department, changes in grade and street repairs causing us to either lower or raise our boxes.

The worst leak that occurred during the year happened at 6.25 p. m., January 3, 1910, in Tremont street, opposite Seaver place, when the easterly 30-inch low service main laid in 1848 broke upon a mass of concrete upon which it was resting. Before the line was shut down a very large quantity of water escaped and flowed through Tremont street to La Grange street, through Eliot and La Grange streets to Washington street, and northerly in Washington street as far as Boylston square. It also flowed into Van Rensselaer place. About every basement or cellar on both sides of the streets named was flooded and in places where the cellars were extra deep, as in the cases of the Majestic, Globe and Gaiety

Theaters, the water accumulated to depths of from two to five feet. The performances at all three theaters were prevented, and it was only by the most energetic work on the part of the department that the water was removed and conditions improved so as to allow a resumption of business. At the time the department received notice of the break the emergency automobile and its crew was out answering another call; a delay of about eight minutes occurred on this account, but once upon the spot the gates were closed as quickly as possible. Two 30-inch and one 16-inch gates are all that are necessary to control the line at this point, but as the westerly 30-inch line runs parallel within a few feet distant it was necessary to close the gates on that line before it could be determined which line was broken. Two additional 30-inch gates, therefore, were operated. All this was done in eighty minutes from the time the notice was received at department headquarters. It was a bitter cold night and succeeding day, and the work of removing the water from the cellars and making repairs proceeded with difficulty. We were handicapped by a lack of efficient pumping apparatus, and I wish to say here that, if the department expects to cope successfully with breaks of a similar nature, it will have to provide itself with an equipment of power pumps. The ordinary hand diaphragm pump is practically of no value in emergencies of this nature. The cause of the break was the concrete placed over a sewer and under our pipe. This faulty condition was created when the pipe was shifted to the east in 1896 to make room for the arch of the subway. The concrete was not laid for the entire distance under our pipe. It was placed just at the point of fracture and it was the uneven resistance combined with natural settlement that produced the break.

The morning after the break a number of clerks were sent into the buildings of the district affected by the leak and a thorough examination of each place and a schedule of all property found damaged was made. This was of great value in the settlement of the claims filed. It helped greatly to controvert the exaggerated statements of the claimants. Furthermore, an experienced adjuster and appraiser, Mr. John B. Graham, was engaged to make quick settlement of all claims possible without resort to the courts. I find from experience, in matters of this kind, that immediate settlements usually result to the advantage of the



PORTIONS OF 30-INCH PIPE BROKEN IN TREMONT STREET, OPPOSITE SEAVER PLACE, JANUARY 3, 1910. THE TRIANGULAR PIECE IN FOREGROUND WAS BLOWN OUT. THE CRACK IN LARGE PIECE RAN THE WHOLE LENGTH OF PIPE (9 FEET). THE PIPE WAS LAID IN 1848. (See Page 49.)

department. Upon the basis of settlements thus far made I should estimate the total damage at \$23,000. The cost of repairing the break was \$885.66. The cost of pumping out and cleaning the cellars and clerical expense was \$438.65.

Many leaks and breaks have occurred in this part of Tremont street since the subway was built in 1896, all due more or less to the same cause, viz., uneven resistance of the pipe bed, this in turn being due to the disturbance caused by the building of the subway and the shifting and laying of pipes in unsuitable locations. Following is a list of the important ones and the cost of repairs. No mention is made of the damages paid by the department for loss to property. This item in many cases was large, and in one case in particular, that of August 8, 1900, when the 30-inch main broke at Hotel Touraine, was very large, running into thousands of dollars.

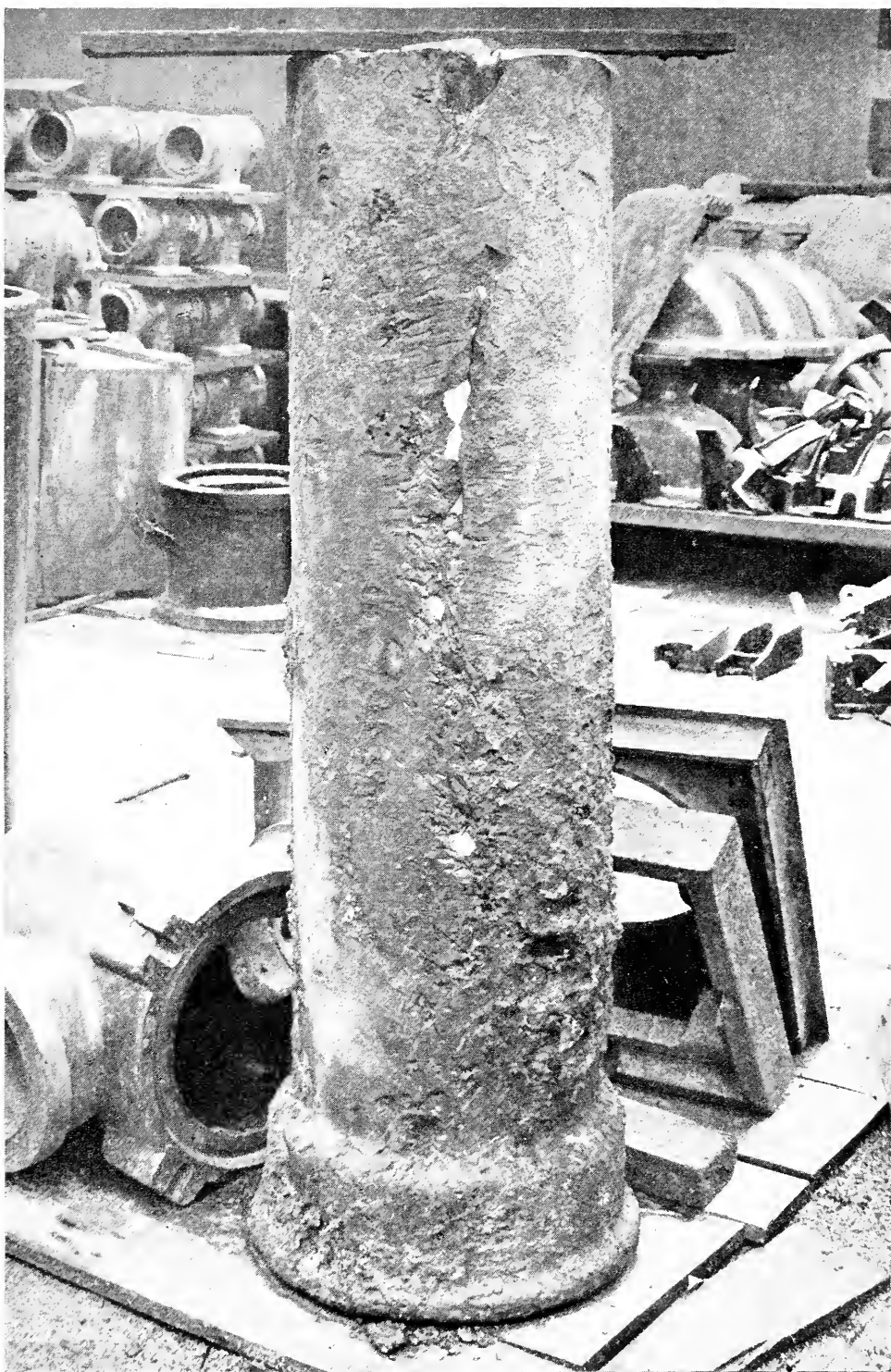
DATE.	Location.	Cause.	Cost of Repairs.
May 14, 1897....	Tremont street, at Common street, easterly 30-inch main.	Broken, $\frac{1}{2}$ rigid bearing on subway roof.	\$189 64
Aug. 11, 1898....	Tremont street, near Hollis street, westerly 30-inch main.	Pipe split. Sewer manhole built over main, $\frac{1}{2}$ subway.	153 41
May 5, 1899....	Tremont street, at Pleasant street, 30-inch main.	Joint leaking, $\frac{1}{2}$ settlement.	17 36
Aug. 30, 1899....	Tremont street, opposite Common street, easterly 30-inch main.	Split, $\frac{1}{2}$ settlement, rigid bearing on subway.	358 52
Aug. 8, 1900....	Tremont street, at Hotel Touraine, easterly 30-inch main.	Pipe broken by settlement. Rigid bearing on side of subway; piers supporting it improperly.	2,204 52
		Cost of stripping and strengthening with brick piers; raising and moving laterally 192 feet.	5,182 89
Sept. 5, 1900....	Tremont street, at Hollis street, 30-inch main.	Split, $\frac{1}{2}$ settlement. Rigid bearing. Subway timbers left in ground.	435 10
Nov. 23, 1903....	Tremont street, opposite Hollis street, 30-inch main.	Joint leaking, $\frac{1}{2}$ settlement.	20 55
Mar. 29, 1904....	Tremont street, opposite Common street, westerly 30-inch main.	Split, $\frac{1}{2}$ settlement. Rigid support resting on roof of subway.	307 00
Mar. 1, 1907....	291 Tremont street, 30-inch main.	Joint leaking, $\frac{1}{2}$ settlement. Pulled out.	56 97
May 13, 1907....	Tremont street, at Hollis street, Hollis street 16-inch main.	Broken by settlement. Rigid support resting on roof of subway.	157 93

After the break at Hotel Touraine in August, 1900, an attempt was made to give the easterly 30-inch main a better bed with more uniform support, and it was stripped from Boylston street to a point near La Grange street and raised and moved laterally and brick piers built under it. The work was stopped, however, at the point mentioned and nothing has been done since. I would advise continuing the work of stripping, examining, raising, supporting, etc., in a southerly direction as far as the point in Tremont street north of Hollis street where the pipe crosses to the westerly side of the street. If this is not done we shall have repetitions of these sometimes disastrous breaks.

Another point in the system that needs attention ere something serious happens is the northerly abutment of the Castle Street Bridge, where the two 30-inch mains descend into Tremont street. The curve of the pipes is both vertical and horizontal and the vibration due to passing trains, together with the loose nature of the soil, has tended to work the joints apart and many times in the last few years we have been called upon to make repairs. The lines will have to be broken out and made up again, using new castings, as we have no duplicates of the extra long curves used. This cannot be done too soon as the result of a break at this point would be of serious consequence.

The department is quite often called upon to remove the boxes covering our pipes on bridges. This work is occasioned through no fault of the box but because the Bridge Division or the railroad wish to redeck the bridge. If that part of the decking under the box were independent of the rest, or, better still, if the pipe were carried under the decking, some expense might be spared the department.

In pursuance of a plan to uncover all pipes at bridge abutments, examinations were made of the pipes at Brookline Avenue, Commonwealth Avenue and Beacon Street Bridges. At the two former places they were found to be all right, but at the Beacon Street Bridge a serious condition was exposed. Two 36-inch wrought-iron pipes cross this bridge and at both abutments converge underground into Y-branches, the single ends of which are 48 inches in diameter. The joint connecting the easterly end of the southerly wrought-iron pipe to the cast-iron pipe of the Y-branch was drawn out



PIPE TAKEN FROM CORNER OF WALTHAM AND WASHINGTON STREETS,
MARCH 25, 1909. A GOOD EXAMPLE OF THE EFFECT
OF ELECTROLYSIS. (See Page 53.)

about 3 inches and very near the point of separation. The pipe was broken out and relaid iron to iron and the joints re-run and tightly calked. The ends of the wrought-iron pipes underground were found to be in a fairly good condition, due no doubt to the dry, gravelly soil, but as there was some rust and pits they were scraped, painted with red lead and covered with a 3-inch jacket of cement mortar. This last precaution is more or less experimental. The conditions found in this case prove the necessity of examining all bridge pipes at the abutments.

At Waltham and Washington streets the 12-inch Waltham street main was exposed to repair a leak caused by electrolysis. A section of the pipe was disintegrated by electrical action. Incidentally unusual conditions were disclosed. The water main was found resting on a sewer at one point and upon an abandoned gas drip box at another. A conduit for electric wires rested on top of the water pipe. Here was a threefold violation of the rules of pipe laying, which might have been prevented by proper inspection and supervision.

In Harrison avenue, opposite No. 1115, while searching for a supposed leak, a private pipe sewer was found running along over our main in such a manner as to cover our corporation cocks and prevent their operation in the usual way from above. The sewer was suspended by wires from an electric conduit. Several of the wires had broken and allowed the sewer to drop upon our main. This caused the sewer house connections to break and the sewage to escape and the connections to become stopped. All this trouble was caused by the improper way in which the sewer was constructed. That it was done knowingly was evidenced by the fact that the main uprights or tubes on our corporation cocks were removed.

In Callahan place, off Western avenue, Brighton, a very peculiar condition was found in our 6-inch main at the end of the place. Two perfectly round holes about $1\frac{1}{2}$ inches in diameter and directly opposite each other were found in the pipe. The holes were in all probability the work of electrolysis, as a large power house is on the opposite side of the river and the returning current traveled along the pipe to the end whence it went into the ground and across the river to the dynamo

where it started. There was nothing to indicate how long the pipe had been leaking thus. The escaping water probably found its way to Charles river, not very far distant.

The 20-inch pipe crossing under the tracks in the railroad yard at South Boston still continues as a source of trouble, leaks occurring from time to time due to vibration. Just as soon as the water is turned on through the new line entering South Boston by way of Congress street tunnel this pipe should be abandoned, the department thereby being saved further expense and the railroad further inconvenience.

No serious leaks have occurred during the year in the pipes crossing Charles river at Warren Bridge. An examination of the 30-inch line at one of the quarter bends on the Boston side of the siphon revealed a sleeve joint almost entirely pulled out. A very good job of putting the pipe together, tightening the tie rods and running new joints was done by our Charlestown foreman and the pipe has not troubled us since. The fact remains, however, that these pipes should be carried across the river in a tunnel and not in the present precarious way.

In Trumbull street the 4-inch main was found split in a catch-basin through which it was laid. About 10,000 gallons an hour had been running into the basin for an indefinite period. This was quite a considerable item in waste and it was due to the Deacon meter system that it was found. The main was relaid properly.

In Lake street, Brighton, where the 12-inch main crosses a culvert, about one and one-half inches of a joint had "blown out," and water escaped at the rate of about 5,000 gallons an hour. How long this had been going on is unknown. The Deacon meter system was responsible for the location of this leak also.

In the early fall of the year it was necessary, on account of the rebuilding of the Huntington Avenue Bridge over the Boston & Albany Railroad, to remove the old 16-inch and 20-inch wrought-iron pipes that have done service there for many years and replace them with cast-iron pipes of the same sizes in slightly different locations. The old wrought-iron pipes were very much worn and eaten by locomotive gases, and it was well that they were removed before they failed. The insides were very much corroded and coated to a thickness of almost two inches.

A 42-inch pipe on the westerly side of the bridge was supported by the bridge builders during the rebuilding

of the structure. The large old main girders were placed parallel to both sides of the pipe and were supported by blocking and timbers. Crosspieces of timber were placed upon the tops of the girders and iron straps or yokes, at short spaces apart, held the pipe suspended. The ends of the straps or yokes passed through the crosspieces of timber and were held in proper adjustment by means of large nuts moving on threads and turn-buckles. This arrangement proved a very good support, and the line was maintained in service throughout the progress of the work, with practically no settlement or movement of the joints. New girders were placed in position, a special bay for our pipe was provided, and cast-iron crossbeams, with the ends resting on the bottom flanges of the girders, supported the pipe. The ends of the crossbeams where they rested on the flanges of the girders were covered with concrete to protect them from the locomotive gases, and the pipe was wedged with oak wedges upon each crossbeam to prevent a lateral movement. The whole bay, which runs under the sidewalk of the bridge, is covered by reinforced concrete slabs. They can be removed any time it is necessary to approach the pipe from above. An air valve is placed in the pipe to be operated through a manhole in the sidewalk above. All expense to this department was charged to the cost of rebuilding the bridge.

The work of inspecting, testing and oiling gates was continued by the gang especially detailed for that class of work, with good results. The gang consists of seven men and two teams, and since it was organized, August 24, 1908, it has worked upon gates as follows: From August 24, 1908, to December 3, 1908, and from March 12, 1909, to December 7, 1909, or 306 working days. The remainder of the time was spent in hydrant work, the weather not being suitable for gate inspection. During the time engaged in inspection the following work was done:

Seven thousand and ninety-five gates tested, oiled and packed, if necessary, in the city proper, South Boston, Roxbury and Back Bay districts. The large gates were gone over several times and received special attention. A considerable number of small gates have been gone over twice. In connection with the work of testing, etc., 1,952 boxes have been cleared of mud, water, tin cans, stones, dead animals, etc.

The locations of all gates have been marked on buildings, poles or some stationary object. Poles holding signs indicating the distances and directions of gates at points where there are many gates located within a small area have been erected. Other similar signs have been attached to trolley poles. Such work has been done in about sixteen or eighteen cases. About 200 gate covers that were worn out or marked incorrectly have been replaced or exchanged.

One hundred gates were found to be either missing on the plans, or else upon the plan but not in the ground.

Found twelve gates that required repairs to the extent of replacing them with new ones.

Two hundred decayed boxes and tops were found and reported.

One 36-inch box at Brookline avenue and Beacon street found packed solidly with dirt, where some one had used it as a dumping place. At Beacon and Exeter streets a large chamber on the 40-inch line was found filled in the same way, except that it contained crushed stone and was more difficult to remove.

A gear upon a 24-inch gate, near South and Walter streets, West Roxbury, was found broken where a steam roller had crushed into the box and pressed it.

Most important of all, one 6-inch division gate, between the high and low service in South Boston, was found open, allowing a very large quantity of water daily to flow from the high to low service.

Twenty-nine high service and twenty low service gates of various sizes, ranging from 4-inch to 20-inch, were found closed and impeding the circulation. About 300 gates of all sizes in both the high and low service systems were found partially closed.

An interesting fact in connection with these closed gates was that about 24 of them were located within an area of about one-sixth of a square mile. Four thousand three hundred cards have been made out and filed, giving data concerning each gate, the idea being that eventually we shall have a complete card system of the gates containing all necessary data, the system to be maintained and used as a part of the gate inspection system. On account of lack of clerical help it is impossible to record every movement of each gate in the department. This, however, should be done as we could then know who

operated a gate last, and responsibility for negligence or improper operation could be placed.

While operating a large gate more men are required than at other times. In the congested parts of the city, men with signal flags are used to keep vehicles and pedestrians from going into the manholes.

A considerable amount of lost time is caused by the repairing or packing of a gate, as the gang as a whole cannot move faster than its slowest man, which is the repairer at work upon the gate. We of course try other gates in the vicinity while the repairer is at work, but if they are found to need attention it means that the gang with its tools and team must remain within a limited distance. Another impediment is the entering of buildings to ascertain whether or not pipes that show in the streets are in service or not. It is not unusual to find a fire or elevator gate in the street which to all appearances controls a pipe that is in service, when in reality it is cut off in the foundation wall and sometimes not even plugged or capped. The consequences may readily be imagined should we open the gate on such a pipe. Furthermore, the building has to be notified of our intention to lower the gate, as even a momentary interruption in the supply sometimes causes inconvenience and alarm, and it is not unusual that upon lowering the gate it is impossible through some defect in its mechanism to raise it again, hence the building is without water and without notice. This spells trouble in large type.

Our investigations in this line have revealed conditions that are surprising. Fire pipes that were supposedly protecting buildings from fire, and thereby affording the owner a basis for a reduction in his insurance rate, have been found shut off, sometimes without the knowledge of the owner and at other times with his knowledge and with his indifference as to whether or not they are turned on.

HYDRANTS.

During the year **256** public and **2** private hydrants were established, and **151** public and **3** private hydrants were abandoned, making a total number of **8,024** public and **307** private and suburban hydrants connected with the system January 31, 1910. This work comprised not only the establishment of additional new hydrants, but also the changing of the style and location of old hydrants.

Following is a statement of hydrant work performed during the year and cost of same:

HYDRANTS.—ADDITIONAL AND CHANGES IN STYLE AND LOCATION.

NUMBER.	Cost of Material.	Cost of Labor, Teaming, etc.	Total Cost.
115, additional.....	\$9,687 94	\$1,446 02	\$11,133 96
154, changes in style and location	6,758 25	3,735 67	10,493 92
269 total.....	\$16,446 19	\$5,181 69	\$21,627 88

NOTE.— The changes include eleven hydrants abandoned which were not replaced.

HYDRANT REPAIRS.

NATURE OF WORK.	Number.	Cost.
Barrels changed.....	107	\$2,091 56
Barrels cleaned out.....	2	3 51
Barrels repaired for various causes.....	225	583 42
Blown off.....	3	4 14
Boxes cleaned out.....	1,298	506 46
Boxes inspected.....	354	54 87
Boxes pumped out.....	190	110 61
Boxes raised and lowered.....	117	483 11
Boxes renewed.....	263	3,934 92
Boxes repaired.....	123	507 28
Chains inspected and repaired... ..	1,844	281 43
Covers cleaned of snow.....	150	15 75
Frames, covers and bonnets renewed.....	47	231 90
Hydrants raised and lowered.....	22	630 33
Inspected on account of cold weather.....	34,223	7,329 11
New branch.....	1	31 85
Oiled.....	487	141 35
Painted.....	5,007	1,402 87
Relocated.....	34	958 33
Repaired on account of operations of Sewer Division.....	1	2 77
Streets repaved on account of hydrant work.....	156	767 04
Tested.....	2	4 50
Thawed out.....	21	19 59
Wasted.....	937	48 88
		\$20,145 58

From the foregoing it may readily be seen that the hydrants are quite an expense to the department. Nothing is received from the Fire Department for their use nor for the water used at fires. It is therefore apparent that the Water Department is contributing in large measure to the work and cost of extinguishing fires out of a special tax (water rates), while the general presumption holds that fire protection is supported by the general tax levy.

The largest item in hydrant maintenance is "inspection." This always will be a necessary work, as in our cold and variable climate it is almost impossible to have hydrants in a condition for quick use without inspection. This is especially the case since hydrants have been used to such an extent by the Sewer, Street Cleaning, Street Watering and Highway Divisions of the city and numerous contractors. The men in the employ of the aforesaid are either ignorant or indifferent as to the proper manner in which to operate the hydrants, and as a result serious defects occur which have to be first located and then remedied. It is necessary in cold weather to follow the Fire Department closely and examine every hydrant that has been opened by that department. This, of course, might be obviated if the Fire Department saw that every hydrant which was opened was left in proper condition, but they do not do so and cannot be depended upon for that service. Around the wharves and in the outlying districts there are boxes which have to be pumped out every day or else the water accumulating in them from the tide and springs will freeze and at the same time freeze the hydrant.

One cannot plan upon any particular economy in the inspection of hydrants, as the winter it is intended to carry it out may be a severely cold one and a most thorough and continuous inspection will be imperative. In this climate of ours we may have two or three weeks of mild weather and feeling presumptuous as to the necessity of inspection lay off the men, only to find it necessary a few days afterward to recall them.

The renewal of boxes is a matter of much importance and expense. Of the several thousand in the streets there is always a certain number collapsed or so near that state as to be dangerous and require immediate attention. It is not unusual to have suits for damages grow out of these cases. The use of concrete boxes is expected to prevent occurrences of this nature within a few years.

The Boston post hydrant is used by the department wherever practicable and is giving thorough satisfaction.

I must again urge the restriction of the use of hydrants to the Fire and Water Departments. No others should operate them unless it is considered desirable that a large percentage of them should be more or less defective all the time.

Tables III. and IV. appended show the number of each style of hydrant, public and private, established and abandoned during the year, the districts in which they are located and the total number in the system January 31, 1910.

SERVICE PIPES.

Thirteen hundred eighty-one service pipes, of diameters varying from $\frac{5}{8}$ inch to 16 inches, were laid during the year, and 377 were abandoned. The net increase for the year was 1,004. The total number of service pipes in the system is 96,049. The term "service pipe" includes not only those pipes supplying water to premises for strictly domestic purposes, but also fire, motor and elevator pipes. Tables V. and VI. appended give details as to number, size, length in feet, etc. All $\frac{5}{8}$ -inch pipes are made of lead. Those ranging from $\frac{3}{4}$ -inch to 2-inch, inclusive, are of lead and lead-lined iron. Pipes of 3 inches and upward are of cast iron.

The cost of laying and abandoning service pipes during the year may be found in the tables following:

COST OF LAYING NEW (OR ADDITIONAL) SERVICE PIPES.

Size.	Number.	Length in Feet.	Material.	Labor, Teaming, etc.	Repaving.	Blasting.	Total Cost.	Average Cost per Service.	Average Cost per Linear Foot.
16-inch.	1	86	\$251 24	\$68 97	.....	.....	\$320 21	\$320 21	\$3 72
10-inch.	2	17	75 30	85 52	.....	.....	160 82	80 41	9 46
6-inch.	2	34½	63 66	55 88	.....	.....	119 54	59 77	3 46
4-inch.	65	1,311½	3,136 11	1,979 93	\$309 76	.....	5,425 80	83 47	4 14
3-inch.	27	569½	1,194 73	794 93	91 61	.....	2,081 27	77 08	3 65
2-inch.	8	179½	185 24	99 30	.....	.....	284 54	35 57	1 58
1½-inch.	16	354	317 66	219 64	68 97	.....	606 27	37 89	1 71
1¼-inch.	7	259½	143 13	111 39	.....	\$9 50	264 02	37 72	1 01
1¾-inch.	55	1,249	683 36	676 70	.....	50 00	1,410 06	25 64	1 13
¾-inch.	81	2,007½	857 97	878 34	26 64	.....	1,762 95	21 76	88
½-inch.	999	22,507½	7,507 93	9,898 63	75 80	1,121 00	18,603 36	18 62	83

COST OF SERVICE PIPES ABANDONED AND PLUGGED INDEPENDENTLY OF OTHER WORK.

SIZE.	Number.	Length in Feet.	Material.	Labor, Team- ing, etc.	Repaving.	Total Cost.	Credit (Stock Re- covered).	Net Total Cost.	Average Cost per Service.	Average Cost per Linear Foot.
6-inch.....	1	30	\$2 29	\$17 88	.....	\$20 17	\$12 40	\$7 77	\$7 77	\$0 26
4-inch.....	2	18	17 19	28 78	.....	45 97	8 09	37 88	18 94	2 10
3-inch.....	3	167	1 67	35 18	.....	36 85	8 98	27 87	9 29	17
2-inch.....	3	15½	2 06	36 05	.....	38 11	16 19	21 92	7 31	1 41
1½-inch.....	5	120	1 12	25 73	.....	26 85	14 30	12 55	2 51	10
1¼-inch.....	1	3	23	3 44	.....	3 67	3 34	33	33	11
1-inch.....	6	88	1 04	45 98	\$9 34	56 36	11 00	45 36	7 56	52
¾-inch.....	12	346½	2 48	78 34	9 02	89 84	8 68	81 16	6 76	23
⅝-inch.....	198	4,145	43 72	1,213 89	166 16	1,423 77	143 36	1,280 41	6 46	31
½-inch.....	1	50	14	7 82	.....	7 96	58	7 38	7 38	15

As stated in last year's report the demand for larger service pipes is yearly increasing, due to the requirements of modern plumbing, the erection of larger buildings and the installation of the automatic sprinkler system of fire protection. The extension of the high service system is a resultant of these new conditions. The present capacity of that system is limited, however, and if the demands made upon it continue to grow at their present rate provision for a larger supply ought to be made very soon. As at present situated not over one day's supply is available in the event of a crippling of the pumping machinery at Chestnut Hill. The standpipe at Mt. Bellevue is also inadequate for the demand made upon it. The higher parts of the West Roxbury district which it supplies are being rapidly populated. Conditions are such now that when any unusual draft is made upon the system during the day the pumps "race" in their efforts to keep the tank filled.

In the work of maintaining the service pipe system the following statement will show the variety of work done, the causes, number of jobs and the total cost:

KIND OF WORK AND CAUSES.	Number of Jobs.	Total Cost.
Repaired leaks caused by:		
settlement	283	\$3,668 08
defective pipe.....	280	" 2,681 31
defective cock.....	86	676 11
defective coupling.....	86	630 33
defective joint.....	35	443 72
pick hole.....	84	280 53
electrolysis	14	192 82
operations of Sewer Department.....	34	177 80
worn packing.....	14	130 33
operations of Edison Company.....	3	89 76
loose coupling.....	12	70 62
steam roller.....	5	56 37
broken gate screw.....	2	40 71
subway construction.....	2	32 62
defective gate valve.....	1	27 54
cock turned wrong way	5	27 02
chemical action of lime.....	2	25 96
broken connection.....	3	19 30
broken valve stem.....	1	11 57
operations of meter service.....	2	10 59
worn washer.....	1	6 03
gate improperly shut.....	1	3 31
operations of contractor.....	1	2 60
blasting	1	1 46
gate left open.....	1	1 41
Repaved—settlement.....	661	4,822 72
Repaved—no force	434	3,473 68
Shut-off and let on—repairs and nonpayment.....	866	1,736 68
Investigations where no action by department was required.....	718	1,687 51
Regulated uprights above and below grade	2,990	935 23
Repaired defective service uprights.....	86	409 51
Frozen pipes thawed out	14	225 61
Service pipes relocated	27	224 46
Decayed boxes renewed	13	129 73
<i>Carried forward.....</i>	6,768	\$22,953 03

KIND OF WORK AND CAUSES.	Number of Jobs.	Total Cost.
<i>Brought forward</i>	6,768	\$22,953 03
Regulated gate boxes to grade.....	56	233 15
Cut out dead pipes.....	10	102 74
Relocated uprights out of place.....	24	143 37
Established new sidewalk cocks	39	78 11
Cleared uprights filled with dirt	12	75 02
Established new sidewalk uprights, missing	11	56 37
Established new flange boxes, improyement.....	6	38 20
Dirty water blown off.....	9	23 31
Repaired broken frames.....	3	19 73
Repaired defective box.....	1	15 86
Pumped out manhole.....	1	10 68
Established new gate box.....	1	10 01
Cleaned gate boxes.....	2	6 71
Replaced stolen service pipe	1	6 26
Replaced upright tops, missing.....	4	4 62
Replaced box cover, misplaced.....	1	3 49
Repaired loose gate bolts.....	1	3 21
Removed plugs	2	3 19
Replaced missing sidewalk nuts	4	3 13
Cleaned iron box filled with dirt.....	1	2 56
Repaired rusted cock	2	2 32
Tested service for pressure.....	1	1 51
Cleaned up after repairs.....	1	91
Established new combination top.....	1	74
Totals.....	6,962	\$23,798 23

On January 21, 1910, the "off-and-on" force of the Income Division was transferred to the Distribution Division. Twenty-five men were thereby brought into the service of the Distribution Division to perform the work of shutting off and letting on water for repairs, nonpayments, vacancies, etc. Under this arrangement the work can be done more expeditiously and economically, as when pressed with an unusual number of orders the regular repair force of the Distribution Division may help out, and when work is slack the "off-and-on" men can be used in repair work. Furthermore, two men for each outlying district were selected from



LEAD PIPE GNAWED BY RATS, CAUSING LEAK OF ABOUT 3,100 GALLONS AN HOUR. DISCOVERED BY DEACON METER.

the force to serve permanently in those districts as "off-and-on" men. A saving of time and car fares is thus effected, as heretofore the men started on their jobs from a common center—710 Albany street. When bound for remote places in Dorchester, West Roxbury or Brighton much time was consumed in going to and from the jobs. The money received for letting on is forwarded daily to the Income Division, City Hall.

Tables V. and VI., appended, show the number, size and length of service pipes laid and abandoned during the year and the total number of each size and aggregate length in the system January 31, 1910.

METERS.

Chapter 524 of the Acts of 1907 requires all cities and towns supplied by the Metropolitan Water and Sewerage Board to meter all new services and 5 per cent yearly of all old services, except those used for fire or public purposes. Chapter 177 of the Acts of 1909 places a penalty upon the nonobservance of the law of 1907. It was therefore incumbent upon this department to increase its equipment so as to comply with the demands of the law. An arrangement was made so that the Distribution Division assumed the work of installing all outside meters and all repairs on outside meters and meter boxes. This allowed the Meter Department of the Income Division to devote its entire force to the installation of inside meters and the testing and repairing of meters in the shop.

Following is a statement of new meters installed by the Distribution Division and the cost of the work, exclusive of the cost of the meters, also a statement of repairs on outside meters and the cost of same:

**NUMBER AND SIZES OF NEW METERS INSTALLED AND COST OF SAME
(COST OF METER NOT INCLUDED).**

NUMBER SET.		Size.	Cost of Material.	Labor, Teaming, Car Fares, etc.	Total Cost.
Outside.	Inside.				
700.....	.....	$\frac{5}{8}$ -inch	\$5,612 32	\$5,873 11	\$11,485 43
	16.....	$\frac{3}{8}$ -inch	12 69	34 70	47 39 °
74.....	.....	$\frac{3}{4}$ -inch	641 20	663 49	1,304 69
	5.....	$\frac{3}{4}$ -inch	6 15	11 25	17 40
48.....	.....	1-inch	408 85	498 76	907 61
9.....	.....	1½-inch	110 80	108 90	219 70
6.....	.....	2-inch	68 13	90 65	158 78
1.....	.....	3-inch	8 99	28 25	37 24
1.....	.....	4-inch	26 10	24 07	50 17
1.....	.....	6-inch	22 30	40 32	62 62
840.....	21	.....	\$6,917 53	\$7,373 50	\$14,291 03

METER REPAIRS, CAUSES, NUMBER OF JOBS, AND COST OF SAME.

CAUSES.	Number of Jobs.	Cost of Material.	Labor, Teaming, Care Fares, etc.	Total Cost.
Decayed box.....	81	\$447 44	\$636 68	\$1,084 12
Settlement of paving.....	116	62 73	434 66	497 39
Defective box.....	38	29 46	126 29	155 75
Leak, defective pipe.....	25	17 59	103 92	121 51
Abandoned.....	1	.....	11 49	11 49
Frame broken.....	2	5 09	6 29	11 38
Change.....	1	84	9 98	10 82
Boxes inspected.....	18	.....	5 63	5 63
No force.....	4	.....	4 00	4 00
Stoppage.....	2	.....	3 03	3 03
Coupling loose.....	2	.....	1 64	1 64
Cover of box off.....	1	.....	1 13	1 13
Box pumped out.....	1	.....	85	85
Totals.....	292	\$563 15	\$1,345 59	\$1,908 74

WATER POSTS.

During the year one water post for street sprinkling carts was established and four abandoned, leaving a

total number of 516 connected with the system January 31, 1910. The total cost of the work was \$62.41, with a credit of \$74.45 realized from reclaimed stock. The excess of this credit over the cost of work was applied on bills for repairs which are continually being rendered by this department to the Street Cleaning and Watering Division of the Street Department for the care and maintenance of the posts. Formerly these posts were entirely in our charge, but since 1906 we have simply executed orders to do work as issued by the Street Cleaning and Watering Division and charged the expense to that division. Following is a statement of repairs performed by this department on water posts during the year, the number of jobs, the causes and the cost:

WATER POST REPAIRS, CAUSES, NUMBER OF JOBS, AND COST OF SAME.

CAUSES.	Number of Jobs.	Cost of Material.	Labor, Teaming, Car Fares, etc.	Total Cost.
Leaking valve.....	78	\$8 33	\$173 84	\$182 17
Pipe rusted out.....	7	27 45	83 07	110 52
Standpipe leaking.....	14	6 73	81 07	87 80
Post hit by team.....	6	9 23	70 07	79 30
Post arm broken.....	17	15 70	60 74	76 44
Box decayed.....	5	31 45	44 21	75 66
Broken valve.....	28	.....	69 27	69 27
Broken waste cock.....	18	16 23	38 07	54 30
Paving settled.....	5	2 71	48 09	50 80
Shut off for winter.....	51	.....	45 11	45 11
General overhauling.....	2	3 30	27 58	30 88
Main cock broken.....	2	10 56	17 86	28 42
Gate broken at main.....	1	7 62	9 68	17 30
Post arm leaking.....	5	1 45	14 81	16 26
Hard to operate.....	10	.....	15 06	15 06
Leaking waste cock.....	7	.....	14 59	14 59
Post in way of setting edgestone.....	1	33	9 25	9 58
Coupling leaking.....	4	2 84	6 41	9 25
Pipe in way of conduit.....	1	3 80	5 05	8 85
Waste cock broken.....	1	74	6 78	7 52
Nipple broken.....	3	61	6 62	7 23
<i>Carried forward</i>	266	\$149 08	\$847 23	\$996 31

Water Post Repairs, Causes, Number of Jobs and Cost of Same.—*Concluded.*

CAUSES.	Number of Jobs.	Cost of Material.	Labor, Teaming, Car Fares, etc.	Total Cost.
<i>Brought forward</i>	266	\$149 08	\$847 23	\$996 31
Broken frame.....	1	4 59	2 16	6 75
Box top piece decayed.....	3	1 49	4 76	6 25
Waste cock left open.....	1	.....	5 75	5 75
Joint loose.....	3	24	5 44	5 68
Dirt in stop cock box.....	3	.....	4 78	4 78
Not shut off properly.....	4	.....	4 42	4 42
Elbow broken.....	2	43	3 25	3 68
Testing.....	4	.....	3 00	3 00
Main cock leaking.....	1	.....	2 57	2 57
Pick hole in pipe.....	1	10	1 97	2 07
Base loose.....	1	.....	1 44	1 44
Inspection.....	1	.....	85	85
Box full of water.....	1	.....	66	66
Totals.....	292	\$155 93	\$888 28	\$1,044 21

FOUNTAINS.

During the year nine drinking fountains were established, seven for horses and two for the general public. Sixteen were abandoned; they were mostly of the old fashioned type of combination fountains for man and beast. It is the policy of the department at present to do away with these fountains, as the part for man is out of date from a sanitary standpoint, and the part for beasts — a low stone trough — is exposed to abuse from unthinking and malicious persons. In replacing them circular iron bowls with continuous flow of water are erected in the center of squares or street intersections. They are away from the path of those who would abuse them and the bowls are sufficiently high to allow a horse to drink without being unchecked. This last feature is the means of providing many a horse with a drink that would go thirsty in the case of a low stone trough, where the driver is too lazy to descend and uncheck. By locating the new fountains at central points a lesser number was

necessary. Take, for instance, the fountain erected at the intersection of Columbus avenue and Tremont street. This replaced three of the old style located on Columbus avenue at Whittier street, Columbus avenue opposite Police Station 10, and Columbus avenue at Centre street. The traffic passing any of these points is in most cases likely to pass the point where the fountain is now located. One fountain is doing the work of three. Other cases were the same.

The cost of the work of erecting new fountains and removing old ones was as follows:

Stock.	Labor, Teaming, etc.	Total.	Credit by Removed Stock.	Net Cost.
\$1,535 83	\$1,458 13	\$2,993 96	\$1,520 82	\$1,473 14

The work of maintaining the fountains was carried on as usual. In addition to the many repairs necessitated by the wear and tear and abuse of the fixtures the troughs were cleaned daily. Two men are thus employed daily in the central district, and one man in each of the suburban districts makes the round of troughs three times a week. The water is drained off and the inside surface thoroughly scrubbed and periodically burned out with a plumber's torch. The work of maintenance also includes the inspection of cold water fountains throughout the summer, the taking of temperatures and checking the amounts of ice placed in the box by the ice companies under contract. It is my opinion that better results would be realized if the ice were placed in the box in a shaved state, instead of in large cakes as at present. Furthermore, I think that better satisfaction would be had in the matter of ice distribution if it were delivered by one or two teams of the ice company, upon which a representative of this department could ride and observe at first hand the amount of ice placed in the box. As an alternative, the department might distribute the ice itself from various supply points.

Following is a statement of fountain repairs and maintenance, with number of jobs performed, causes and cost of same. Table VII., appended, shows locations of fountains established and abandoned and total number and different styles in service.

FOUNTAIN REPAIRS AND MAINTENANCE.

Causes, Number of Jobs and Cost of Same.

CAUSES.	Number of Jobs.	Cost of Material.	Cost of Labor, Teaming, etc.	Total Cost.
Inspection, taking temperature, etc....	2,153	.....	\$657 73	\$657 73
Inspecting and cleaning horse trough...	1,023	.....	481 50	481 50
General overhauling Brewer fountain,	1	\$107 45	152 43	259 88
Struck by team.....	4	38 57	105 33	143 90
Equipping for summer use.....	51	63 89	79 49	143 38
Leak in supply pipe.....	23	11 49	97 62	109 11
Fountain reset.....	1	16 69	59 43	76 12
Drainpipe plugged.....	14	7 33	64 57	71 90
Fountain painted.....	8	17 41	50 95	68 36
Paving settled.....	8	16 71	43 04	59 75
Dipper stolen.....	73	19 80	33 32	53 12
Faucet broken.....	25	31 07	20 40	51 47
Cock broken.....	8	16 55	34 84	51 39
Waste pipe plugged (dirt, etc.).....	21	.....	27 95	27 95
Boxed over for winter.....	1	6 98	19 83	26 81
Ice box cover broken.....	1	16 81	2 13	18 94
Defective ice box.....	5	4 21	13 16	17 37
Broken coupling.....	1	5 20	10 67	15 87
Nipple broken.....	3	53	13 64	14 17
Dipper worn out.....	36	3 59	17 07	20 66
Grate broken.....	2	8 38	1 37	9 75
Faucet leaking.....	8	1 02	8 70	9 72
Leaking coupling.....	7	13	7 87	8 00
Waste pipe broken.....	1	14	5 75	5 89
Shut-off.....	5	.....	5 85	5 85
Shut off for winter.....	6	.....	5 36	5 36
Let on.....	6	.....	5 18	5 18
Faucet stolen.....	2	1 70	2 85	4 55
S. C. box cover broken.....	1	2 26	1 36	3 62
Upright filled with dirt.....	1	.....	3 56	3 56
Ornamental ball missing.....	2	86	2 70	3 56
Plug stuck in waste pipe.....	1	.....	2 63	2 63
Pipe frozen.....	2	.....	2 60	2 60
Water dirty.....	1	.....	1 88	1 88
<i>Carried forward</i>	3,505	\$398 77	\$2,042 76	\$2,441 53

Fountain Repairs and Maintenance.—*Concluded.*

CAUSES.	Number of Jobs.	Cost of Material.	Cost of Labor, Teaming, etc.	Total Cost.
<i>Brought forward</i>	3,505	\$398 77	\$2,042 76	\$2,441 53
Pumping out water in ice box.....	2	.....	1 74	1 74
Door broken.....	1	49	1 21	1 70
No force.....	1	1 10	50	1 60
Leak in waste pipe.....	1	.....	1 51	1 51
Stop cock leaking.....	1	.....	1 50	1 50
Pipe plugged.....	1	14	1 13	1 27
Broken elbow.....	1	15	1 10	1 25
Totals.....	3,513	\$400 65	\$2,051 45	\$2,452 10

WASTE DETECTION.

The waste detection service was transferred to the Income Division early in the year. In connection with the matter of waste it is interesting to note that the daily per capita consumption during the year just passed was 149 gallons against 158 gallons the previous year. It is estimated that more than one-half of this decrease was due to the repair of large leaks located by the Deacon meter system. The balance was due to the restriction of general waste, brought about by the knowledge that meters were being applied throughout the city.

The Deacon meter in Harvard street, near Washington street, city, abandoned when Washington Street Tunnel was built, was re-established at No. 21 Harvard street during the past year at a cost of \$304.64 exclusive of the meter.

Twelve Deacon meter boxes were renewed at a total cost of \$137.05 and two Deacon meters were repaired at a total cost of \$13.16.

ELECTROLYSIS.

This matter is now attended to by the City Engineer's staff. It is growing in importance, and some time in the near future the process of disintegration now going on in the pipes at various points will reach the point of failure or destruction with serious results. While conditions exist as they are in the street railway system

nothing can be done except to localize the trouble by insulation and inform the street railway company of its presence wherever manifested, so that the company may take steps to recover its stray current and keep it in its proper place.

SHOP WORK.

Reference to the statements of the work done by the various shops in the department will give an idea of the variety and extent of the same.

In the power plant there was used during the year 471,200 pounds of coal as against 497,000 pounds in 1908-09 and 671,200 pounds in 1907-08. The percentage of ash and clinker was 9.61 as against 10.16 in 1908-09 and 13.5 in 1907-08. Coal on hand February 1, 1910, 26,000 pounds. About 50 gallons each of cylinder and engine oil were used during the year.

The machine and carpenter shops are engaged in the regular manufacture of fixtures used by the department in its work. In every shop or factory there are certain fixed charges, or plant costs, which should be added to the direct cost of the output in order to produce the real cost of the articles manufactured. In the case of our carpenter shop this "plant cost" was calculated at about 15 per cent of the labor cost of the boxes and other articles manufactured, and in the case of the machine shop 90 per cent of the cost of the labor was added. This extra is added only to the work done in the shop, and which requires the existence of a shop to facilitate it. All work done by the carpenter and machine shops on the outside does not include this additional factor.

In 1908-09 the "plant cost" of the carpenter shop was 20 per cent and that of the machine shop 70 per cent. The changes in these figures are not due to increased or decreased cost of plant. They are made because we consider the figures of this year as more accurate.

The average cost of the output of the machine shop was about 4 per cent less than that of last year. It should be considered, however, on one side that the costs of the iron and brass castings were about 10 per cent and 2 per cent, respectively, less than they were last year, and on the other side that the percentage for "plant cost," added to the labor, is 20 per cent more this year than last.

Aside from the fact that it is a difficult matter to get men in municipal employ to produce the same output as those in private service, there are other conditions that tend toward an increased cost. For instance, during the year one man in the shop was absent about fourteen weeks on account of sickness; another was out almost the same length of time, due to sickness and jury duty; and another has been absent off and on for some time past, due to sickness also. Men are also frequently called to work on outside work. All this interferes with the uniformity and regularity of the shop work and the output is lessened while the "plant cost" remains the same. Furthermore, the shop might be run at a greater capacity. Several more first-class machinists could be employed and thus the unused power and facilities of the shop utilized. It is of course more economical to run a shop at full capacity than at any less rate. The administration and power costs are practically the same in either case, but in the event of running at full capacity each article of the output bears a lesser proportion of the running cost of the plant. The idea is illustrated by a train of cars running with full load of passengers or half load, in either case the carrying cost is the same.

Another matter that we have to contend with is the difficulty of getting rough stock in sufficient quantity to proceed on different lines of work without the probability of being held up by a lack of stock. Under the present system of buying both iron and brass castings a year's contract is made, and if a new bidder secures the contract, as has been the case each of the last few years, it requires about one-half the year for the foundry to get accustomed to our class of work, and it is only during the latter part of the year that the stock arrives with any uniformity and regularity. It would seem as if the remedy for this was to "stock up" or else have the contract run for a longer period. The first proposition is a most desirable one, as nothing would be of greater assistance than to have a large reserve stock of rough castings to draw from, but our system of yearly appropriations prevents this. The idea of making a long term contract is not desirable because of the usually unsettled condition of the iron and metal markets. Some effort, however, should be made to better conditions in this respect.

In the concrete shop an electric motor was installed to operate the cube mixer. This assists materially, as the mixer when filled with a batch of concrete was very hard to revolve.

Following are statements of the work performed by the various shops and the costs of the same:

MACHINE SHOP.

STOCK MANUFACTURED FROM THE ROUGH.

	Number.	Labor.	90 Per Cent Added.	Stock.	Cost Each.	Total Cost.
3-inch gate valves.....	16	\$3 89	\$7 39	\$4 65	\$12 04	\$192 64
4-inch gate valves.....	69	4 63	8 80	6 03	14 83	1,023 27
6-inch gate valves.....	82	5 43	10 32	10 93	21 25	1,742 50
8-inch gate valves.....	98	6 80	12 92	16 45	29 37	2,878 26
10-inch gate valves.....	42	10 95	20 80	25 18	45 98	1,931 16
12-inch gate valves.....	53	12 25	23 28	31 82	55 10	2,920 30
16-inch gate valves.....	19	27 71	52 65	45 24	97 89	1,859 91
6-inch by-pass gate valves.....	11	7 14	13 57	10 48	24 05	264 55
Boston post hydrants.....	172	11 20	21 28	25 51	46 79	8,047 88
Lowry hydrants, 3 feet 9 inches.....	5	5 16	9 80	16 08	25 88	129 40
Lowry hydrants, 4 feet.....	13	5 16	9 80	17 52	27 32	355 16
Lowry hydrants, 4 feet 3 inches.....	4	5 16	9 80	17 75	27 55	110 20
Blow-off hydrants, 3 inches.....	48	6 06	11 51	10 64	22 15	1,063 20
2-inch air cocks.....	23	1 46	2 77	3 91	6 68	153 64
2-inch air cock bolts.....	36	22	42	24	66	23 76
$\frac{5}{8}$ -inch sidewalk cocks.....	1,033	27	51	25	76	785 08
$\frac{3}{4}$ -inch sidewalk cocks.....	116	40	76	40	1 16	134 56
1-inch sidewalk cocks.....	25	50	95	55	1 50	37 50
1-inch sidewalk cocks (iron pipe).....	51	50	95	77	1 72	87 72
$\frac{5}{8}$ -inch corporation cocks.....	1,857	26	49	27	76	1,411 32
$\frac{3}{4}$ -inch corporation cocks.....	33	50	95	45	1 40	46 20
1 $\frac{1}{2}$ -inch corporation cocks.....	77	65	1 23	1 27	2 50	192 50
$\frac{5}{8}$ -inch stop and waste cocks.....	426	42	80	27	1 07	455 82
$\frac{3}{4}$ -inch stop and waste cocks.....	149	63	1 19	36	1 56	232 44
1-inch stop and waste cocks.....	47	69	1 31	62	1 93	90 71
$\frac{3}{4}$ -inch combination couplings.....	1,436	12	22	18	41	588 76
1-inch combination couplings.....	386	14	26	27	53	204 58
2-inch combination couplings.....	60	24	45	75	1 21	72 60
1-inch combination bent couplings.....	131	20	38	38	76	99 56
1 $\frac{1}{2}$ -inch combination bent couplings....	50	25	47	71	1 18	59 00
2-inch combination bent couplings....	50	29	55	98	1 53	76 50

Stock Manufactured from the Rough.—*Concluded.*

	Number.	Labor.	90 Per Cent Added.	Stock.	Cost Each.	Total Cost.
Female couplings:						
$\frac{5}{8}$ -inch coupling nuts.....	16,169	\$0 01	\$0 019	\$0 04	\$0 059	\$953 97
$\frac{3}{4}$ -inch coupling nuts.....	3,698	02	038	07	108	399 38
1-inch coupling nuts.....	263	04	076	11	186	48 92
$1\frac{1}{2}$ -inch coupling nuts.....	200	06	114	22	334	66 80
$\frac{5}{8}$ -inch coupling tubes.....	15,431	01	019	03	049	756 12
$\frac{3}{4}$ -inch coupling tubes.....	1,862	02	038	06	098	182 48
1-inch coupling tubes.....	758	02	038	08	118	89 44
$1\frac{1}{2}$ -inch coupling tubes.....	313	03	057	19	247	77 31
2-inch coupling tubes.....	112	07	133	27	403	45 14
1-inch meter coupling nuts.....	441	04	076	11	186	82 03
$\frac{5}{8}$ -inch male couplings.....	792	02	038	07	108	85 54
$\frac{3}{4}$ -inch male couplings.....	500	025	047	12	167	83 50
1-inch male couplings.....	99	05	095	14	235	23 27
$1\frac{1}{2}$ -inch meter nipples.....	231	08	15	20	35	80 85
2-inch meter nipples.....	50	115	22	34	56	28 00
Nipples for Doherty cocks.....	15	125	24	10	34	5 10
Nuts for Doherty cocks.....	30	05	095	06	155	4 65
$\frac{3}{8}$ -inch solder nipples.....	56	03	057	05	107	5 99
$\frac{1}{2}$ -inch solder nipples.....	501	03	057	06	117	58 62
1-inch solder nipples.....	179	035	067	10	167	29 89
$1\frac{1}{2}$ -inch solder nipples.....	150	09	17	18	35	52 50
1-inch by $\frac{3}{4}$ -inch meter bushings.....	106	09	17	13	30	31 80
$\frac{3}{4}$ -inch by $\frac{5}{8}$ -inch meter bushings.....	250	04	076	09	166	41 50
1-inch meter bushings.....	372	06	11	15	26	96 72
$\frac{5}{8}$ -inch meter bushings.....	165	04	076	07	146	24 09
$\frac{5}{8}$ -inch iron plugs.....	398	045	085	01	095	37 81
$\frac{7}{8}$ -inch set screws.....	2,695	06	11	018	132	355 74
1-inch set screws.....	72	25	47	036	506	36 43
Sidewalk uprights, bushed and fitted...	2,034	03	057	43	487	990 56
Hydrant wastes.....	154	14	266	19	456	70 22
4-inch jointers.....	5	14	26	42	686	3 43
6-inch jointers.....	10	14	26	53	79	7 90
8-inch jointers.....	13	18	34	64	98	12 74
10-inch jointers.....	5	20	38	75	1 13	5 65
12-inch jointers.....	11	23	44	1 03	1 47	16 17
16-inch jointers.....	2	27	51	1 33	1 84	3 68
30-inch jointers.....	2	40	76	2 47	3 23	6 46
Total.....						\$32,171 08

STOCK REPAIRED AND RENOVATED.

	Number.	Total Cost.*
3-inch gate valves	3	\$5 83
4-inch gate valves	10	38 35
6-inch gate valves	17	51 57
8-inch gate valves	6	15 62
10-inch gate valves	2	7 33
12-inch gate valves	2	6 55
16-inch gate valves	3	19 47
Boston post hydrants	7	50 72
Bachelder post hydrants	15	96 76
Post hydrants	30	106 81
Lowry hydrants	46	131 29
Boston Lowry hydrants	24	60 13
$\frac{5}{8}$ -inch sidewalk cocks	57	2 28
$\frac{5}{8}$ -inch corporation cocks	108	4 32
$\frac{3}{4}$ -inch corporation cocks	13	62
1-inch corporation cocks	9	45
1 $\frac{1}{2}$ -inch corporation cocks	17	85
$\frac{5}{8}$ -inch angle cocks	5	25
$\frac{5}{8}$ -inch coupling nuts	1,300	6 50
$\frac{3}{4}$ -inch coupling nuts	38	31
1-inch coupling nuts	29	31
1 $\frac{1}{2}$ -inch coupling nuts	18	31
2-inch coupling nuts	41	63
$\frac{5}{8}$ -inch coupling tubes	722	3 61
$\frac{3}{4}$ -inch coupling tubes	38	31
1-inch coupling tubes	40	31
1 $\frac{1}{2}$ -inch coupling tubes	13	16
2-inch coupling tubes	11	31
$\frac{1}{2}$ -inch coupling tubes	6	16
Lowry hydrant bolts	7	14
Boston Lowry hydrant bolts	14	31
Hydrant wastes	121	3 63
Corporation padlocks	14	4 47
Smith gate	1	4 75
Total		\$625 42

* 90 per cent is included.

MISCELLANEOUS WORK.

	Number.	Cost.
Drilling,—gates, curves, reducers, offsets, caps, branches, hydrant pots, 16-inch pipe, gate covers, oil cans, flanges for meter department.....	737	\$382 77
Installed heating apparatus in East Boston yard.....		276 74
Installed heating apparatus in stable, 710 Albany street.....		75 70
Reamers made.....	6	73 33
New tools made.....	13	69 65
Wagons repaired.....	9	69 46
Tools repaired.....	110	51 83
Air cock covers planed.....	2	22 80
Dipper handles made.....	300	18 65
Put covers on siphon pipes.....	2	18 35
Boiler in engine room repaired.....		17 57
Gates consigned to junk.....	8	12 85
Stretching bolts (1 inch).....	13	11 16
Labor on defective castings.....		10 77
Hydrant barrels consigned to junk.....	12	10 77
Made gate sign brackets (pairs).....	16	7 15
Made stretching bolts ($\frac{3}{4}$ inch).....	6	5 19
Made stretching bolts ($\frac{5}{8}$ inch).....	6	5 18
Made pump handles.....	16	4 75
Yard gate repaired.....		4 67
Two diaphragm pumps repaired.....		3 63
Meter valve repaired.....		3 00
Made bolt for East Boston yard.....	1	2 06
Axle pins made.....	4	1 30
Total.....		\$1,159 33

CARPENTER SHOP.

STOCK MANUFACTURED.

	Total Cost.
310 small wooden gate valve boxes at \$3.73	\$1,156 30
30 large wooden gate valve boxes at \$4.68	140 40
91 wooden post hydrant boxes at \$4.90	445 90
36 wooden Lowry hydrant boxes at \$4.42	159 12
44 wooden Boston Lowry hydrant boxes at \$6.11	268 84
6 wooden Boston hydrant boxes at \$4.14	24 84
6 wooden Deacon meter boxes at \$4.68	28 08
755 wooden meter boxes at \$4.25	3,208 75
5 wooden blow-off boxes at \$5.40	27 00
<i>Carried forward</i>	\$5,459 23

	Total Cost.
<i>Brought forward</i>	\$5,459 23
117 wooden tops for small gate valve boxes at 50 cents	58 50
24 wooden tops for large gate valve boxes at 55 cents.	13 20
50 wooden tops for post hydrant boxes at 61 cents	30 50
57 wooden tops for Lowry hydrant boxes at 61 cents	34 77
30 wooden tops for meter boxes at 61 cents	18 30
2,041 inches in pieces for raising small gate boxes at 9 cents	183 69
225 inches in pieces for raising large gate boxes at 10 cents.	22 50
1,158 inches in pieces for raising hydrant gate boxes at 10 cents	115 80
3,064 inches in pieces for raising meter boxes at 10 cents	306 40
60 new tools	278 77
12 reservoir covers	49 41
1,768 wooden paving blocks	38 41
10,704 wedges for concrete boxes and main pipe work	113 78
5,845 shelves for meter department	161 57
174 chocks	4 49
204 6-foot pickets	15 66
34 wooden horses	23 11
Cut 14 ground boxes and stands for meter department	9 96
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	\$6,938 05

MISCELLANEOUS WORK.

	Total Cost.
Remodeled East Boston pumping station, to be used as yard headquarters	\$2,658 11
Remodeling and repairing paint shop	957 62
Tool repairs (2,171), filing saws, setting handles, etc.	720 95
Repairs in stable	685 33
Repairs in yard	526 18
Fitting up and repairs in concrete shed	441 84
Repairs (47) on wagons, (3) on buggies, (5) on automobiles	335 32
Repairs in commissioner's office	251 87
Repairs on building, 710 Albany street	124 45
Repairs in machine shop	87 75
Repairs on account of 30-inch leak, January 3, 1910	86 68
Repaired scales	57 84
Repairs at Mt. Bellevue, West Roxbury	42 45
Repairs at Dorchester yard	40 28
Repairs in clerk's office	35 82
Fencing off plot with wire, East Boston Reservoir	35 17
Turned out 524 hammer and chisel handles	34 72
Repairs in superintendent's office	33 33
Repairs at Charlestown yard	29 42
Labor on account of milling stock	28 93
Repairs at Brighton yard	24 57
Repairs at Parker Hill Reservoir	23 38
Repairs on fence around East Boston Reservoir	22 37
Made 61-foot box for thawing pipes	19 60
Repairs on account of Engineering Department	19 20
Repairs in electric shop	15 12
Repairs on superintendent's automobile	14 49
Made oak box for emergency automobile	13 38
Made tank for meter room	11 83
Made runs to clean out East Boston Reservoir	8 76
Cutting stock for electrician	8 20
Made box for storeroom	7 27
Repairs on launch "Water Witch"	7 06
Repaired oil shed	7 62
Made 6 book rests for office	6 75
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<i>Carried forward</i>	\$7,423 66

	Total Cost.
<i>Brought forward</i>	\$7,423 66
Repairs on tool house	5 94
Made sign for East Boston headquarters	5 85
Made 400 feet half-round molding	4 27
Made 3 gate location signs	3 93
Made 2 settees for Doherty's tool house	3 86
Repairs at Fisher Hill Reservoir	3 28
Cut stock for box cover at Long Island	3 03
Put new belt on circular saw	2 71
Repairs on desk, East Boston district	1 36
	<u>\$7,457 89</u>

**CONCRETE BOX SHOP.
STOCK MANUFACTURED.**

	Labor.	Stock.	Cost Each.	Total Cost.
338 post hydrant concrete boxes, 1 $\frac{1}{4}$ inches thick..	\$4 66	\$1 42	\$6 08	\$2,055 04
312 small gate valve concrete boxes, 1 $\frac{3}{4}$ inches thick.....	4 66	1 29	5 95	1,856 40
224 meter concrete boxes, 1 $\frac{1}{4}$ inches thick.....	4 66	1 38	6 04	1,352 96
37 hydrant blow-off concrete boxes, 1 $\frac{3}{4}$ inches thick.....	4 66	1 87	6 53	241 61
13 Lowry hydrant concrete boxes, 1 $\frac{3}{4}$ inches thick.....	4 80	1 61	6 41	83 33
924				<u>\$5,589 34</u>

BLACKSMITH SHOP.

STOCK MANUFACTURED AND MISCELLANEOUS WORK.

	Total Cost.
Sharpened 9,587 picks, 1,269 bars, 3,956 chisels, 49 wedges .	\$1,098 87
Made 547 new tools	567 04
Repaired 1,605 tools	393 55
Made 3,397 dowels	309 65
Repaired 44 wagons.	136 47
Made 986 post hydrant bolts	98 60
Installed motor, gearing, etc., for concrete mixer	72 18
Repairs on emergency automobile	59 57
Made 12 pairs straps	46 17
Repaired shop machinery	42 55
Repairs in yard, 710 Albany street	35 92
Made 228 Lowry hydrant bolts	34 02
Repairs in stable	33 23
Repairs in East Boston yard	26 06
Repaired roaster	25 25
Put rings and chains on 241 hydrant caps	22 92
Made 2 seals for gate covers	14 02
Made 12 brackets for gate chambers	12 78
Made 80 expansion bolts.	9 02
Made 14 $\frac{7}{8}$ -inch eyebolts	7 29
Made 40 Boston Lowry bolts	6 47
<i>Carried forward</i>	<u>\$3,051 63</u>

	Total Cost.
<i>Brought forward</i>	\$3,051 63
Made 256 post hydrant keys	5 71
Made 4 plates	5 15
Made 8 pairs 4-inch pipe bands	4 65
Repaired 2 buggies	4 11
Made 200 S hooks	4 10
Made 230 hammer wedges	3 04
Made special pair 12-inch puddling head straps	2 78
Made 2 26-inch eyebolts	2 42
Made 10 clamps for main pipe repairs	2 20
Made 61 wedges	2 11
Made 7 rings for whiffletrees	2 10
Made 1 set straps for East Boston yard	2 09
Repairs in Charlestown yard	1 78
Repaired tool box for West Roxbury yard	1 18
Made 54 staples	1 13
Repaired 1 harness	81
Repairs in engine room	78
Made 2 bolts for machine shop	75
Repaired office chair	67
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	<u>\$3,099 19</u>

PLUMBING SHOP.

ELECTRICAL WORK.

	Total Cost.
Electric lights installed in stable	\$131 29
Electric lights installed in concrete shed	48 04
Electric lights installed in wagon shed	50 70
Electric lights installed in yard shed ("senate")	28 59
Electric lights installed in driveway	15 36
Electric lights installed in first, second and third floor, 710 Albany street	94 95
Electric lights installed in clerk's office	110 17
Electric lights installed in meter office	72 38
Electric lights installed in superintendent's toilet	20 30
Electric lights installed in plumbing shop	79 24
Electric lights installed in hallway, 710 Albany street	23 87
Electric lights installed in storeroom	157 53
Electric lights installed in meter room	56 82
Electric lights installed in Brighton yard	94 01
Electric lights installed in Fisher Hill Reservoir	91 55
Electric lights installed in emergency automobile	42 61
Electric lights installed in superintendent's automobile	54 55
Electric lights installed in new headquarters, East Boston	227 82
Applying electrical power to concrete mixer	136 16
Installed horse clipper in stable	113 50
Moved indicator, East Boston yard, from old to new headquarters	109 86
Wired commissioner's automobile for lights	50 26
Alterations in wiring commissioner's office	40 90
Nineteen batteries renewed	40 48
Installed private telephone in commissioner's office	37 44
Installed telephone between main office and garage	35 10
New cable on standpipe, Orient Heights	34 04
Installed private telephone in superintendent's office	33 80
Installed microphane set in machine shop	32 95
Installed storage battery in garage	22 93
Repaired 4 indicators	16 73
Repairs, East Boston Reservoir	14 56
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<i>Carried forward</i>	\$2,118 49

WATER DEPARTMENT.

81

	Total Cost.
<i>Brought forward</i>	\$2,118 49
Adjusted 4 transmitters	12 87
Rewired commissioner's automobile	12 23
Installed electric bells in stable	12 06
Renewed batteries	11 28
Repairs, Parker Hill Reservoir	10 63
Installed extension lights in garage	8 19
Installed press button in plumbing shop	7 02
Repairs on superintendent's automobile	6 91
Inspected 2 indicators	6 00
Installed extension lights in paint shop	5 96
Installed binding posts, Post Office Building	4 03
Installed indicator, East Boston yard	3 84
Installed extension lights in Dorchester yard	2 11
Installed extension lights in stable	1 92
Repaired switch in concrete shed	1 32
Labor, delivering horn signal to East Boston yard	1 31
Placed new receiver and rubber cushion on office telephone	1 06
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	\$2,227 23

MISCELLANEOUS WORK.

	Total Cost.
Plumbing work in new headquarters, East Boston	\$278 23
Repairs in stable	69 95
Repairs in main building, Albany street yard	49 03
Repairs in paint shop	36 96
Repairs on automobiles	30 27
Repairs in concrete shed	28 70
Repaired 30 tools	23 85
Made 600 nipples for concrete boxes	21 60
Made 17 tools	20 82
Repairs in brass finishing room	19 64
Repairs in machine shop	13 63
Locating pressure gauge	12 69
Repairs in meter room	10 64
Repairing washbowl in upper office	8 72
Repairs in office	8 27
Repairs in engine room	7 58
Cut and bent wire for concrete boxes	7 50
Repaired radiator	5 82
Soldered 25 2-inch air cocks	5 60
Made 125 iron nipples for rammers	5 35
Repaired sink in "senate"	3 68
Repairs in Dorchester yard	3 00
Pumping sediment out of pipe in office	2 63
Repairs in blacksmith shop	97
Repairs in carpenter shop	44
Repairs in electric shop	44
Repaired pipe for testing	37
Soldered Deacon meter wires	40
Made oil can for automobile	40
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	\$677 18

PATTERN SHOP.

	Total Cost.
Made 203 patterns	\$1,029 77
Repaired 108 patterns	597 24
Shellacked 76 patterns	28 13
Labor, storing patterns	18 71
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<i>Carried forward</i>	\$1,673 85

	Total Cost.
<i>Brought forward</i>	\$1,673 85
Made case of drawers for shop	16 21
Repairs in shop	12 38
Labor, account cleaning two lathes	10 13
Repaired 6 tools	9 00
Labor, account putting in lumber	7 53
Labor, account taking stock	6 23
Labor, account carrying patterns to foundry	4 50
Labor, account filing saws	4 16
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	<u>\$1,743 99</u>

PAINT SHOP.

MISCELLANEOUS WORK.	Total Cost.
Painted stable and emergency room 710 Albany street	\$605 33
Painted new headquarters, East Boston yard	553 38
Painted fence and buildings, Charlestown yard	401 65
Painted 12 wagons and buggies	303 56
Painted, varnished, etc., in superintendent's office, 710 Albany street	184 89
Painted in main building (hallways, etc.), 710 Albany street	164 61
Setting glass in main building, 710 Albany street	88 96
Painted commissioner's office	87 32
Painting in yard, main gate, etc., 710 Albany street	49 67
Painted gates, sleeves and branches (stock)	47 54
Painted pattern room, 710 Albany street	38 22
Painted motor boat (Engineering Department)	34 30
Painted 19 tools (derricks, etc.)	33 27
Painted 9 gate signs	30 78
Painted annex to concrete shed, 710 Albany street	25 79
Painted 2 tool houses	20 16
Set glass in tower, Mt. Bellevue, West Roxbury	14 39
Painted superintendent's automobile	13 97
Painting in Dorchester yard (painted sign)	13 14
Setting large light of glass at 18 Howard street	6 00
Cleaned and shellacked chairs and desks in storeroom	5 45
Painted standpipe door, Orient Heights, East Boston	4 31
Lettered large light of glass at 18 Howard street	1 46
Set glass in tool house	1 43
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	<u>\$2,729 58</u>

MISCELLANEOUS WORK.

	Total Cost.
1,026 inspections of patch paving	\$844 21
Portion of yard at 710 Albany street paved	747 51
Masonry work of all kinds, account of fitting up new headquarters at East Boston	665 64
Laboring work, removing old pumps and foundations and doing a variety of things in connection with fitting up new headquarters at East Boston	334 24
343 inspections of corporation work underground	250 99
2 pressure gauges established in West Roxbury	174 29
5 sets of test holes dug for Engineering Department	143 82
Cleaned sidewalks of snow and ice at East Boston Reservoir,	95 08
New brickwork in engine room, Albany street	91 54
105 inspections of department street openings	84 58
Watching pipes account of sewer construction	84 00
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<i>Carried forward</i>	\$3,515 90

	Total Cost.
<i>Brought forward</i>	\$3,515 90
Installed heating apparatus in paint shop (work by Engineer Abbott)	78 21
Labor, delivering water from hydrants	62 15
Built new fence at new East Boston headquarters	57 38
Extended steam pipe underground to paint shop (work by yard men)	30 58
Labor, investigating pipes crossing bridges	30 25
Cleaned out East Boston Reservoir	26 93
Cleaned snow from sidewalks, East Boston yard	24 19
Cleaned snow from sidewalks, Charlestown yard	24 63
Accommodation work	21 59
Labor, account taking stock	19 25
Put composition footboard on step of emergency car No. 72,	17 86
Extended heating apparatus in storeroom (work by Engineer Abbott)	7 31
Equipment for engineer's launch, "Water Witch"	6 60
Labor, testing tools for Engineering Department	2 95
Abandoned pressure gauge	1 83
Stable repairs	84
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	<u>\$3,928 45</u>

PROPERTY AND PLANT.

Albany Street Yard.—Another slice was taken off our yard during the past year when the City Hospital built a large chimney thereon and enlarged their boiler and engine room. This restricts us more than ever and tends to prevent free movement and accommodation for stock. We are often compelled to allow a good bargain on lumber to pass by for want of storage space.

The work of renovating the paint shop started last year and was continued and finished in the spring. This once old building is now practically made over and is well fitted for its purpose. Electric lights were installed, and steam heat substituted for stoves which were a constant source of danger in a building containing paints and oils. A slate roof replaced the old shingled one, thus giving further protection from fire, as in dry weather, when the wind was in a certain direction, sparks from the old wheelwright furnace, now used to melt out old joints and burn up the yard rubbish, would fall upon the shingles and ignite. A platform was built around the paint shop and castings rearranged upon it. Bins were built to hold small castings like caps, tubes, sidewalk tops, etc. They were covered and suitably marked and are a great improvement on the old broken-down stalls that allowed the rain and snow to beat upon the castings. Other platforms were built upon which to pile castings. The work of enlarging the concrete box shop was continued and finished. More

drying racks were built and an electric motor with gearing installed to turn the mixer. Wide platforms of stout build were placed outside the new concrete ageing and storage shed to further extend its capacity. The old "senate" or tool room and lead shed was rebuilt and much improved. Electric lights were installed throughout the yard in all the buildings, and are a great convenience and improvement over the ancient lantern. The main gate to the yard was taken down and rebuilt and a new sign placed over it. The old gate was in a dangerous condition and liable to collapse. A granite block pavement was laid in the driveway, between the main gateway and the stable entrance, and from that point easterly to a point in front of the concrete box shop, in all about 400 square yards. This was a much needed improvement, as in winter and in rainy weather the driveway was a mass of mud. I think that each year a little paving should be done until eventually all the driveways of the yard will be paved. It will save the horses, the wagons, the expense of patching, and the dust that is blown about on windy days. The large yard scales was rebuilt and other minor improvements made. In the main building electric lights were installed in all except a small portion of the building. The hallways were whitewashed and painted. The superintendent's office was renovated and painted, new lower window sashes put in and telephones to various parts of the building installed. Many windows in the main building, of which there are about 225, were reglazed. Much more of this work will be required, as they are in bad condition. Two automobiles were purchased and fitted up for use as emergency cars. The old emergency wagon was assigned to other use and the quarters of the old wagon were entirely rebuilt and fitted as a garage for the emergency cars. Steam heat was introduced, electric lights and a new artificial stone floor with drain in center and running water with sink and hose attachments put in. These cars are simply what has been needed for some time past and will enable the department to cope with the demands of the times. An automobile was purchased for the superintendent to enable him personally to keep in touch with all parts of the department. Four old and disabled horses were humanely killed, three were sold for cash, one sold in trade and seven purchased. In March a colt was born



AUTOMOBILE PURCHASED JUNE 1, 1909, AND EQUIPPED FOR EMERGENCY SERVICE. (See Page 84.)

of a mare purchased in the latter part of last year. As it shows signs of becoming a good horse the department will keep it and try to raise it. Thus far it is thriving. The horses generally are in good condition, as shown by the fact that at the last work horse parade all our horses that were entered — about a dozen — took prizes for condition and good qualities. The department now owns 58 horses, 4 automobiles, 36 wagons, single and double, 18 carriages of all kinds, 23 sleighs and pungs, 3 road rollers and 13 portable tool houses. During the year such of these wagons and carriages that required it were overhauled, repaired and painted. Two old wagons beyond repair were sold in trade for new ones, and three old carriages, also too far gone, were sold by auction. The result of the thorough work in this line begun in the previous year is being felt in the better condition generally of the rolling stock and the lesser number of repairs required. Old harnesses that were too far gone to repair were sold or exchanged in part for new ones. A harness repairer's kit was purchased and considerable small repair work was done by ourselves with economy to the department. Oiled duck covers were purchased and are worn by the horses on rainy days, saving the harnesses and the horses from the effects of the weather. A clipping machine run by electric power was installed in the stable, and will tend to make the work easier and quicker. The outside stable walls were pointed and the roof repaired. Stalls were repaired and the interior of the stable painted and whitewashed. In general, the yard and buildings are now in better condition than at any time for years, and it is our aim and hope to keep them so.

The following old material was sold during the year:

- 696,627 pounds cast-iron junk.
- 18,948 pounds brass junk.
- 8,875 pounds composition turnings.
- 1,052 pounds lead dross.
- 496 pounds old hard rubber.
- 235 pounds old rubber boots.
- 210 pounds old automobile tire cases.
- 13 pounds old automobile inner tubes.
- 738 pounds old fire hose.
- 454 pounds old rope.
- 2 lots wrought-iron junk.
- 1 old 16-inch wrought-iron pipe.
- 1 old 20-inch wrought-iron pipe.
- 3 old horses.
- 1 Democrat body and seat.
- 1 old Concord buggy.
- 4 old carriage tops.

- 1 pair heavy wagon shafts (new).
- 1 pair light wagon shafts (old).
- 1 pair carriage shafts.
- 4 carriage wheels.
- 2 axles and boxes.
- 2 new tailboards.
- 1 old lead furnace.
- 1 old Concord buggy.
- 1 old tripod.
- 1 old fall for same.
- 1 old lead furnace, pot and ladle.
- 1 old 8-inch jointer.
- 1 old wagon.

Dorchester Yard.— As this yard was placed in first-class condition during the previous year there was not much to be done during the year just past. A new sign was erected over the gate in Gibson street, and the foreman has planted flowers and shrubbery in a space in the center of the yard, thus improving the looks of things generally.

Charlestown Yard.— The several buildings in this yard were painted outside and inside, the windows reglazed, a large wooden platform for unloading and loading stock built, and a general finishing up of the extensive repairs started in the previous year. A new sign was hung upon the building, and the property may be said to be in first-class condition.

West Roxbury Yard.— Practically nothing of importance was done here. The yard and building are not owned by the city. Larger and more central quarters should be secured, as this district is rapidly growing in extent and importance. We are so limited for space that we are now stabling one of our horses in an adjoining building owned by the man of whom we rent the yard. All our wagons, tools and stock are exposed without shelter in the yard and something should be done at once towards improving conditions.

Brighton Yard.— There is no “yard” in its stricter sense in this district, nothing but a stable, a wagon shed and a small office. As this district will be a very important one before long something should be done at once towards securing proper quarters. Electric lights were installed during the year and this makes the building a little more habitable. Previously the dim light of a lantern was the only illumination. It is hoped that a move into a better place will occur before a great while.

East Boston Yard.— For some time past the old brick pumping station in Condor street, opposite Brooks street, was unoccupied, as the introduction of the high

service into Breed's Island by the Metropolitan Water Board rendered pumping unnecessary. The building was well made and had a commodious yard in its rear, while the regular district headquarters, located upon the Brooks street side of the reservoir in a small space between the foot of the reservoir bank and the street fence, was wholly inadequate and furthermore could not be approached from any side without climbing a hill. It was therefore considered as a good move to abandon the quarters at the reservoir and move into the old pumping station. This was done September 16, 1909. Considerable work was necessary, however, before the station was fit to be occupied. The former coal pocket, underground on the street side, but at grade with the yard in the rear, was sheathed and made into a first-class stable with four stalls and up to date sanitary features; the pumps and pump foundations were removed from the main room, toilets and modern plumbing put in; a floor built half way up in the ell and a shop and storeroom thus provided; windows built into the brick walls to light this room and others glazed and fitted with new sashes; a chain hoist set up; the tall chimney that formerly served the boilers taken down and removed; the two old boilers sold and removed; a steam heating plant installed; a new iron smokestack erected; a cess-pool built in the rear to serve as drainage for the stable and washstand, they being below the grade of the street sewer; a large shed built in the yard to serve as a shelter for wagons and stock; the office provided with furniture; electric lights installed throughout; the large mercury and recording gauge moved from the old building to the new; the whole place painted, varnished and shellacked; the roof repaired; the brick work pointed and painted; conductors attached; a new high fence built around the yard, and a general fitting up, so that at the present time we have a model district headquarters that will serve for many years. The work was all done by the department employees, except the smokestack and roofing and some pointing. More than all, by filling in from time to time, we shall finally have a wharf property abutting on Chelsea creek. This will be a valuable asset to the department. The old buildings on the reservoir site were sold and removed. The department will fill in the foundations, build a fence in the gap left where the buildings were, spread loam, grade and seed the soil as soon as the weather permits. The total cost of the transfer to, and fitting up of, the new headquarters,

with the exception of a little more work to be done on the shed in the yard, is as follows:

Carpenter work	\$2,663 96
Mason's work	665 64
Painting work	553 38
Electrical work	341 52
Plumbing work	278 23
Steamfitting work	276 74
New heater and fitting	116 80
Blacksmith's work	30 21
Laborers' work in building fence	57 38
Miscellaneous	334 24
	<hr/>
	<u>\$5,318 10</u>

East Boston Reservoir.— In the early part of the year the reservoir was emptied and the bottom and sides cleaned. Considerable mud and foreign matter were found and removed. However closely it is watched, mischievous people will throw things into the water. The water may never be used; yet that cannot be decided upon with certainty until a new and independent supply enters the island.

Fisher Hill Reservoir.— Although small for present demands made upon it, it is in generally good condition. Electric lights were installed in the gatehouse during the year.

Brookline Reservoir.— This reservoir is of no further use to the department and should be disposed of.

Parker Hill Reservoir.— This reservoir and grounds should be transferred to the Park Department and thus relieve the Water Department of its care and maintenance. It is of no value as a reservoir.

Mt. Bellevue Standpipe, West Roxbury.— Some repairs will be necessary here soon. The tank leaks slightly in the seams at one or two places — not seriously, however. A little painting will have to be done. If possible the tank should be drained off and an internal examination made. It would be well to know whether or not deterioration of the iron is progressing too fast. The grounds around the standpipe are cared for by the Park Department.

West Roxbury Pumping Station.— Although this station is owned by the Boston Water Department it is occupied and maintained by the Metropolitan Water Board.

Orient Heights Standpipe, East Boston.— This tank is in practically the same condition as the one at Mt. Bellevue, with probably a few more slight leaks in the seams. It should be examined and repaired the coming spring. The windows in the building surrounding the tank have been completely demolished by mis-

chievous boys and should be replaced by wooden shutters. Much trouble is experienced by the failure of the float and indicating apparatus to work at all times. During such times the water in the tank has to be watched, else it will overflow without being known until damage had been done. Occasionally it does overflow, but upon each occasion it has been discovered in time. The wires connecting the apparatus in the tank with that in the office at East Boston headquarters very often break or become detached and ground. They are subject to the same troubles as all overhead wires and have to be examined and repaired frequently.

Recording Pressure Gauges.—Gauges were established during the year in the quarters of Engine Company No. 45 at Washington street, at Poplar street, West Roxbury, and in those of Engine Company No. 30, Centre street, at Bellevue street, West Roxbury. The total cost of the work was \$174.29.

The following recording pressure gauges are the property of the department. They were installed and are maintained by this division, and the readings recorded by the Engineering Department. They are all in good working order:

LOCATION.	Service.	Grade of Gauge Above City Base.	NORMAL PRESSURE IN POUNDS PER SQUARE INCH.			
			3 a. m.	9 a. m.	1 p. m.	5 p. m.
Chestnut Hill Pumping Station.....	Low	127.5	6	17	17	14
Boston Common.....	Low	48.4	40	36	36	37
Salem street, Engine 8.....	Low	27.2	45	41	41	42
East street, Engine 7.....	Low	22.7	48	44	44	45
Milk street, Post Office Building.....	Low	20.9	48	48		
Congress street, Engine 38.....	Low	21.1	46	41	41	42
Fourth street, at O street, Engine 2.....	Low	51.8	33	30	30	31
710 Albany street.....	Low	24.0	50	42	42	43
Gibson street, Water Department.....	Low	29.3	46	40	41	41
Western avenue, Engine 34.....	Low	27.5	49	48	48	48
Bunker Hill street, Engine 32.....	Spot Pond	36.0	56	54	54	54
Marion street, Engine 5.....	Spot Pond	64.3	39	34	35	35
City Hall.....	High	105.1	62	56		
Quincy street, Engine 24.....	High	98.3	64	58		
Walnut street, Engine 20.....	High	20.8	97	90		
Norfolk street, Engine 19.....	High	79.1	72	70		
Chestnut Hill avenue, Engine 29.....	High	111.5	60	57		
Centre street, Engine 28.....	High	82.9	72	68		
Centre street, Engine 30.....	High	172.0	33	30		
Washington street, Engine 45.....	High	84.4	71	68		
Deer Island.....	Spot Pond	35.5	28	28		
Moon Island.....	High	33.0	78	70		
Long Island.....	High	65.8	63	53		
Fort Warren.....	High	25.0	78	60		

Following are appended tables and statements of department statistics.

Respectfully submitted,

GEORGE H. FINNERAN,
Superintendent.

TABLE I.

Showing Length of Main Lines of Water Pipes and Connections Owned and Operated by Boston Water Department and Number of Valves Set in Same January 31, 1910.

	DIAMETER OF PIPES IN INCHES.															Totals.	
	48	42	40	36	30	28	24	20	16	12	10	8	6	4	3		2
Length owned and operated January 31, 1909 (feet)...	39,175	16,813	23,104	43,493	90,114	244	77,453	95,724	208,913	1,224,414	171,667	625,466	1,279,382	69,447	5,826	5,524	3,976,756
Gate valves in same.....	12	6	11	19	56	....	63	74	410	2,567	555	1,762	3,941	508	10	7	10,001
Air valves in same.....	24	5	10	24	59	2	34	40	23	28	3	.....	3	.....	.....	.....	255
Blow-offs in same.....	8	3	6	11	27	....	17	42	57	135	21	24	27	2	.....	.....	380
Length laid and relaid dur- ing year 1909-10 (feet)...	.....	.....	.....	313	6,478	....	412	122	5,004	16,248	12,619	19,106	2,926	10	.....	89	63,327
Gate valves in same.....	.....	.....	.....	.....	1	....	2	.....	19	69	51	80	23	1	.....	1	247
Air valves in same.....	.....	.....	.....	.....	7	....	3	2	4	.....	.....	.....	.....	.....	.....	.....	16
Blow-offs in same.....	.....	.....	.....	.....	2	....	.....	.....	2	3	.....	7	6	1	.....	.....	21
Length abandoned during year 1909-10 (feet).....	.....	.....	.....	.....	.....	....	35	122	328	3,256	516	1,167	11,398	3,959	.....	.....	20,781
Gate valves in same.....	.....	.....	.....	.....	.....	....	1	.....	2	9	3	9	58	13	.....	.....	95
Air valves in same.....	.....	.....	.....	.....	.....	....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	2
Blow-offs in same.....	.....	.....	.....	.....	.....	....	.....	.....	.....	4	1	.....	.....	.....	.....	.....	5
Length owned and operated January 31, 1910 (feet)...	39,175	16,813	23,104	43,806	96,592	244	77,830	95,724	213,589	1,237,406	183,770	643,405	1,270,910	65,498	5,826	5,613	*4,019,305
Gate valves in same.....	12	6	11	19	57	....	64	74	427	2,627	603	1,833	3,906	496	10	8	10,153
Air valves in same.....	24	5	10	24	66	2	37	41	26	28	3	.....	3	.....	.....	.....	269
Blow-offs in same.....	8	3	6	11	29	....	17	42	59	134	20	31	33	3	.....	.....	396

* 761.23 miles.

Pages 91 and 92 have been eliminated.

TABLE II.
Statement of Hydrant, Blow-off and Reservoir Pipes, January 31, 1910.

	DIAMETER IN INCHES.								Totals.
	16	12	10	9	8	6	4	3	
Total length connected with system January 31, 1909.....	474	6,576	150	2,293	2,976	43,538	6,399	44	62,450
Length laid and relaid during the year.....	.....	69	.....	.....	563	1,092	28	.....	1,752
Length abandoned during the year.....	.....	34	.....	.....	.....	317	75	.....	426
Total length connected with the system January 31, 1910.....	474	6,611	150	2,293	3,539	44,313	6,352	44	63,776

TABLE III.

Hydrants Established and Abandoned during the Year.

	ESTABLISHED.						ABANDONED.					
	Lowry.	Boston Lowry.	Ordinary Post.	Boston Post.	Boston.	Totals.	Lowry.	Boston Lowry.	Ordinary Post.	Boston Post.	Boston.	Totals.
City Proper (public).....	8	1	...	38	...	47	12	1	4	8	12	37
Roxbury (public).....	1	3	3	35	...	42	5	6	11	3	...	25
West Roxbury (public)....	1	8	1	31	...	41	3	10	4	2	1	20
Brighton (public).....	...	4	...	11	...	15	...	3	...	...	...	3
Brighton (private).....	...	...	1	...	...	1	...	...	...	...	...	...
Dorchester (public).....	...	14	2	38	1	55	3	14	7	1	1	26
Dorchester (private).....	...	...	...	1	...	1	...	...	...	1	...	1
South Boston (public)....	...	...	...	31	...	31	6	1	7	4	1	19
East Boston (public).....	...	2	...	9	...	11	3	2	3	...	...	8
Charlestown (public).....	1	...	...	13	...	14	9	...	2	2	...	13
Quincy.....	...	...	...	...	...	...	...	...	1	...	...	1
Brookline.....	...	...	...	...	...	...	...	1	...	...	...	1
Total number of public....	11	32	6	206	1	256	41	37	38	20	15	151
Total number of private....	...	...	1	1	...	2	...	1	1	1	...	3

TABLE IV.

Total Number of Hydrants in System, January 31, 1910.

	Lowry.	Boston Lowry.	Ordinary Post.	Boston Post.	Boston.	Totals.
City Proper (public).....	599	49	247	496	94	1,485
“ (private).....	4	...	9	5	39	57
Roxbury (public).....	465	88	421	334	37	1,345
“ (private).....	2	1	...	3	10	16
West Roxbury (public)....	99	224	648	206	25	1,202
“ (private).....	...	...	16	...	1	17
Brighton (public).....	74	93	391	46	18	622
“ (private).....	...	...	8	...	2	10
Dorchester (public).....	385	232	949	386	27	1,979
“ (private).....	...	1	3	8	4	16
South Boston (public)....	177	33	135	239	28	612
“ (private).....	3	...	15	...	28	46
East Boston (public).....	107	33	170	119	6	435
“ (private).....	8	...	7	...	25	40
Charlestown (public).....	161	45	31	105	2	344
“ (private).....	14	1	37	...	6	58
Deer Island (private).....	...	...	21	...	...	21
Long Island (private).....	...	...	6	...	...	6
Thompson's Island (private)	...	...	2	...	...	2
Gallop's Island (private)...	...	...	1	...	1	2
Rainsford Island (private)...	...	...	3	...	1	4
Quincy.....	...	1	10	...	...	11
Brookline.....	...	1	...	...	...	1
Total number of public hydrants.....	2,067	797	2,992	1,931	237	8,024
Total number of private and suburban hydrants.....	31	5	138	16	117	307

TABLE V.

Statement of Service Pipes Laid and Abandoned during the Year ending January 31, 1910.

SIZES OF SERVICES LAID AND ABANDONED.	CITY PROPER.		ROXBURY.		WEST ROXBURY.		BRIGHTON.		DORCHESTER.		SOUTH BOSTON.		EAST BOSTON.		CHARLES- TOWN.		TOTALS.	
	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.	Number of	Length in Feet.
16-inch laid.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	86
10-inch laid.....	2	34	2	17	..	..	..	..	..	..	..	..	..	..	..	..	2	17
6-inch abandoned.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	34
6-inch abandoned.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	30
4-inch laid.....	48	744	1	48	3	71	4	102	1	24	1	24	7	252	3	46	71	1,371
4-inch abandoned.....	6	54	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	62
3-inch laid.....	22	428	2	59	1	24	1	24	1	16	2	37	1	4	1	4	32	685
3-inch abandoned.....	4	164	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	220
2-inch laid.....	6	147	3	75	2	37	1	16	1	16	1	56	1	20	1	..	15	347
2-inch abandoned.....	4	50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	220
1½-inch laid.....	18	407	1	25	3	80	4	69	4	69	1	41	..	..	1	2	5	52
1½-inch abandoned.....	3	96	1	13	..	..	2	18	2	49	1	29	..	..	..	..	31	747
1½-inch laid.....	7	279	..	..	..	..	1	32	2	49	1	29	..	..	..	..	6	127
1½-inch abandoned.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	389
1-inch laid.....	50	1,271	1	11	1	3	8	149	23	509	5	133	6	172	3	87	112	2,723
1-inch abandoned.....	16	293	8	179	1	28	2	46	18	405	9	187	4	68	3	64	20	374
1-inch laid.....	13	320	1	7	1	13	24	740	482	10,414	25	632	79	1,837	4	88	21	624
1-inch abandoned.....	17	536	..	..	..	..	111	2,463	17	288	27	831	14	285	12	172	1,011	22,888
¾-inch laid.....	25	851	192	4,523	12	274	..	..	..	..	1	20	..	..	..	..	303	7,275
¾-inch abandoned.....	194	4,641	3	79	..	..	..	..	..	..	..	..	..	..	2	44	6	146
¾-inch abandoned.....	3	82	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total laid.....	191	4,481	128	2,946	219	5,194	153	3,596	535	11,588	45	1,169	97	2,349	13	285	1,381	31,608
Total abandoned.....	247	5,916	6	765	6	110	15	318	21	352	29	907	16	304	17	252	377	8,924
Net increase.....	..	..	102	2,181	213	5,084	138	3,278	514	11,236	16	262	81	2,045	..	33	1,004	22,684
Net decrease.....	56	1,435	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..

TABLE VI.

Total Number and Aggregate Length of Service Pipes of Various Sizes Connected with System, January 31, 1910.

SIZES.	Total Number.	Aggregate Length.
16-inch.....	2	95
12-inch.....	14	3,542
10-inch.....	4	1,366
8-inch.....	26	2,751
6-inch.....	147	21,654
4-inch.....	1,165	46,490
3-inch.....	748	22,303
2-inch.....	1,849	59,539
1½-inch.....	1,304	39,827
1¼-inch.....	339	10,944
1-inch.....	2,411	132,151
¾-inch.....	2,582	94,633
⅝-inch.....	78,478	2,216,814
½-inch.....	6,980	159,954
Totals.....	96,049	2,812,063

TABLE VII.

Fountains.

Style.

Established during the Year.

- B. Junction of Columbus avenue and Tremont street, Roxbury.
- B. Junction of Hancock and Pleasant streets, Dorchester.
- B. Junction of Washington and River streets, Dorchester.
- B. Junction of Blue Hill avenue and Washington street, Roxbury.
- B. Forest Hills square, West Roxbury.
- B. Haymarket square, city proper.
- B. Junction of Old Colony and Dorchester avenues, South Boston.
- E. Bowdoin square, at Revere House, city proper.
- H. Bainbridge street, corner of Dale street, Roxbury.

Abandoned during the Year.

- A. Haymarket square, city proper.
- A. Columbus avenue, at Washington street, Roxbury.
- A. Columbus avenue, at Whittier street, Roxbury.
- A. Columbus avenue, at Roxbury street, Roxbury.
- A. Columbus avenue, at Centre street, Roxbury.
- A. Junction of Blue Hill avenue and Washington street, Roxbury.
- A. Western avenue, at North Harvard street, Brighton.
- A. Washington street, at South street, West Roxbury.
- B. Forest Hills square, West Roxbury.
- D. Blue Hill avenue, near Glenway street, Dorchester.
- E. Hudson street, at Quincy Schoolhouse, city proper.
- F. Upham's Corner, Dorchester.
- F. Freeport street, at Beach street, Dorchester.
- F. Washington street, at River street, Dorchester.
- F. Pierce square, Dorchester.
- F. Adams street, at Minot street, Dorchester.

Number of Fountains in Service January 31, 1910.

DISTRICTS.	Style A.	Style B.	Style C.	Style D.	Style E.	Style F.	Style G.	Style H.	Totals.
City Proper.....	8	6	7	.....	12	.....	.....	.....	33
Roxbury.....	3	4	1	.....	5	.....	.....	1	14
West Roxbury.....	4	1	.....	1	2	.....	.....	.....	8
Brighton.....	4	.....	1	.....	.....	.....	.....	.....	5
Dorchester.....	.....	5	2	.....	.....	1	1	.....	9
South Boston.....	1	2	4	.....	4	.....	.....	.....	11
East Boston.....	.....	4	3	.....	4	.....	.....	.....	11
Charlestown.....	1	3	.....	.....	4	.....	.....	.....	8
Totals.....	21	25	18	1	31	1	1	1	99

Style.

NOTE.

- A. Indicates fountain for man and beast, with automatic fixtures for man and beast in warm weather and a continuous flow of water for beasts in cold weather.
 B. Indicates fountain for beasts only. Continuous flow of water during the year.
 C. Indicates fountain for man only. Automatic fixtures. In service during warm weather only.
 D. Indicates fountain for man and beast. Automatic fixtures for both. In service during warm weather only.
 E. Indicates cold water fountain for man only. Automatic fixtures. In service during warm weather only.
 F. Indicates fountain for man and beast, with automatic fixtures for man in warm weather and a continuous flow of water for beasts all the year.
 G. Indicates fountain for man and beast. Hygienic "bubble" fixtures for man. Continuous flow of water for man and beast all the year.
 H. Indicates fountain for man only. "Bubble" fixtures controlled by self-closing cocks. In service during warm weather only.

REPORT OF ENGINEER.

BOSTON, February 1, 1910.

MR. WILLIAM E. HANNAN,

Water Commissioner:

DEAR SIR,— The work of the Engineering Department in 1909 was of the usual varied character.

The past year saw the completion of the improved low service supply for South Boston, work on which began in 1904 when the tunnel was built under Fort Point channel at the draw on Congress street. In this connection the following work was done during the past year: The 30-inch main in C street, South Boston, was extended in C street, C street extension, Northern avenue and Sleeper street to a junction with the 24-inch main in Congress street, a total distance of about 5,750 feet; the 30-inch main in Congress street, city proper, was extended from Atlantic avenue to Fort Point channel; 24-inch pipe was laid on the trestles built in 1907 over Fort Point channel from the ends of the tunnel to the Boston and South Boston shores, and connection was made with the 30-inch pipe previously laid in the tunnel, thus completing the line between the city proper and South Boston. At the same time a 16-inch high service pipe was laid on the trestles and connected with the 20-inch high service pipe in the tunnel in anticipation of future extension of this service. This new low service line both greatly strengthens the supply to South Boston and affords a new "feed" for the city proper.

The Deacon meters were operated to detect waste from April 8 until November 24 in the residential districts of the city proper, in Charlestown, South Boston, Roxbury and Jamaica Plain; the saving of water effected was approximately two and one-half million gallons per day, or about four gallons per capita for the entire population of the city. The cost of the work was \$3,546. Of the waste found, 1,720,000 gallons per day was in service pipes in the streets; 430,000 gallons per day in broken main pipe; 206,000 gallons per day in defective joints in main pipe, and about the same amount in hydrants and watering posts. The result represents a part only of the waste existing in

the territory tested, as no inspection was made inside of buildings, while the outside inspection was incomplete, the larger leaks only and those most easily found being located. Although the saving made was comparatively small, yet it is an earnest of what might be accomplished in restricting waste if the Deacon meter readings were followed up by thorough inspection both outside and inside of buildings. The meter simply locates waste within certain limits and measures its amount; to definitely locate that waste is the duty of the inspector, a duty demanding honest and intelligent work.

On January 3 of this year a break occurred in the easterly 30-inch main in Tremont street, opposite Seaver place, with a large resulting damage to property in the vicinity. The cause of the break was the rigid bearing of the pipe at one point upon the concrete reinforcement of a pipe sewer built by the Transit Commission in 1897, immediately outside of the wall of the subway and directly under the water pipe; the sewer was rigidly supported upon piers, extending down to the bottom of the side wall of the subway, and was evidently designed with a safe clearance between its concrete covering and the bottom of the pipe. Where the break occurred this design had not been followed, the concrete being found hard up against the pipe for a distance of about six inches. The pipe, laid in 1847, was found to be in excellent condition, practically the only deterioration discovered being on the inside under the tubercles. The following is an analysis of the metal:

Silicon	1.70
Sulphur	0.094
Manganese	0.82
Phosphorus	0.79
Combined Carbon	0.60
Graphitic Carbon	2.98

This is the eighth break which has occurred in the large water pipes in Tremont street, between Boylston and Common streets, since the construction of the subway under them. The apparent cause in each case was identical with that of the recent break, viz., a rigid bearing at one point with opportunity for a slight settlement in the adjacent pipes.

The following is a memorandum of the breaks that have occurred, with a statement of the condition found in each case:

1897, May 12. Easterly, 30-inch main opposite Common street. Rigid bearing on subway roof.

1898, August 11. Westerly, 30-inch main opposite Children's Mission. Rigid bearing on manhole over subway.

1899, September 1. Easterly, 30-inch main opposite Common street. Rigid bearing on subway roof.

1900, August 8. Easterly, 30-inch main at Hotel Touraine. Rigid bearing on subway wall.

1900, September 5. Easterly, 30-inch main at Hollis street. Rigid bearing on wooden post supported from subway roof.

1904, March 23. Westerly, 30-inch main opposite Common street. Rigid bearing on subway roof.

1907, May 13. Sixteen-inch main at Hollis street. Rigid bearing on subway roof.

1910, January 3. Easterly, 30-inch main opposite Seaver place. Rigid bearing on concrete over sewer.

A gauge has been installed in the office of the Engineering Department in City Hall, which registers the pressure in the low service system at a point about 1,200 feet distant; it has not been possible heretofore to obtain such a record, the City Hall being situated in the high service area. The operating mechanism of the gauge is located in the basement of the Post Office and consists of a diaphragm connected with the low service main in Milk street by a small pipe, a lever and transmitter; the varying pressure on the main is electrically registered at City Hall, where it is both indicated on a dial and recorded in permanent form on a chart.

I renew the following recommendations, made in last year's report, viz., that a standpipe be built on the northerly portion of the "double-high" system in West Roxbury, and that additional storage be provided at Mt. Bellevue on the same service. That a storage reservoir or reservoirs be built on the high service system, large enough to hold at least six days' supply for the entire high service of the city. That a tunnel be built under the Charles river at Warren Bridge to insure a safe connection between the large mains in Boston and Charlestown and to safeguard the high service supply of Charlestown.

Respectfully submitted,

WILLIAM JACKSON,
City Engineer.

Average Monthly Heights, in Feet, Above Boston City Base, to which Water Rose at Different Stations on the Boston Waterworks.

1909.	SOUTHERN HIGH SERVICE.																NORTHERN HIGH SERVICE.			
	City Hall.		Engine House No. 24, Quincy and Warren Streets, Roxbury.		Engine House No. 20, Walnut Street, Neponset.		Engine House No. 19, Norfolk Street, Mattapan.		Engine House No. 28, Centre, near Green Street, Jamaica Plain.		Engine House No. 30, Centre, near Bellevue Street, West Roxbury.		Engine House No. 45, Washington and Poplar Streets, Roslindale.		Engine House No. 29, Chestnut Hill Avenue, Brighton.		Engine House No. 32, Bunker Hill Street, Charlestown.		Engine House No. 5, Marion Street, East Boston.	
	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.
January	216	233	243	231	241	229	246	239	248	242	.....	.....	.....	.....	247	244	162	158	150	139
February	216	233	243	231	241	228	246	239	248	242	.....	.....	.....	.....	247	243	162	157	150	139
March	216	233	243	230	241	228	246	238	248	242	.....	.....	.....	.....	247	243	161	155	153	142
April	246	231	242	229	241	227	244	237	247	241	247	238	.....	.....	246	244	162	159	154	144
May	246	231	242	229	242	227	245	236	245	241	247	238	246	238	246	242	163	158	156	144
June	247	232	244	231	244	227	246	235	248	240	247	238	247	238	246	243	165	159	156	144
July	247	232	247	234	244	229	246	237	248	241	247	238	246	238	245	242	163	156	155	142
August	247	234	248	237	245	231	247	239	248	242	247	239	246	239	245	242	164	158	156	141
September	247	234	249	237	245	232	247	239	248	242	247	239	247	240	247	243	163	157	156	144
October	248	234	250	239	246	233	248	239	249	243	247	240	249	240	247	244	163	156	156	144
November	248	236	250	240	246	234	248	240	249	244	248	240	249	241	247	241	162	156	156	145
December	247	237	249	240	245	234	247	241	248	244	247	241	247	242	246	244	162	156	154	144

Average Monthly Heights, in Feet, Above Boston City Base, to which Water Rose at Different Stations on the Boston Waterworks.

1909.		LOW SERVICE.																	
		Chestnut Hill Pumping Station, Brighton.		Engine House No. 34, Western Avenue, Brighton.		Boston Common.		Engine House No. 7, Salem Street, City Proper.		Engine House No. 7, East Street, City Proper.		Engine House No. 38, Congress and Farnsworth Streets, South Boston.		Engine House No. 2, Fourth and O Streets, South Boston.		Water Department Yard, 710 Albany Street, Roxbury.		Water Department Yard, Gibson Street, Dorchester.	
		3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.	3 a. m.	9 a. m.
January	141	165	134	136	134	125	126	118	128	121	122	113	122	112	125	119	122	113	
February	141	166	134	134	134	120	126	113	127	118	121	109	123	109	125	115	124	111	
March	141	165	132	134	133	127	129	121	132	124	127	118	120	119	130	124	130	120	
April	141	166	131	132	133	127	131	121	133	125	128	119	132	120	130	125	130	120	
May	141	165	132	132	137	129	132	124	136	128	131	120	133	121	132	128	132	122	
June	140	165	132	133	137	129	133	124	136	127	131	120	133	120	133	127	131	122	
July	141	166	135	136	137	130	133	126	136	128	131	121	133	121	133	129	132	123	
August	141	166	141	139	142	133	138	127	140	131	134	123	136	124	137	132	135	126	
September	141	160	139	138	140	134	139	129	139	132	133	124	135	125	141	137	135	126	
October	142	158	140	133	141	136	140	130	142	135	135	125	138	127	143	139	137	128	
November	145	157	141	141	145	136	141	131	145	135	138	123	141	128	147	138	140	128	
December	141	158	139	141	140	135	136	130	139	134	132	124	134	126	141	139	133	127	

Monthly Rainfall in Inches during 1909 in Various Places in Eastern Massachusetts.

PLACES.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Framingham.....	4.14	5.77	4.07	4.53	2.31	2.89	1.63	2.82	4.55	1.09	3.24	3.94	40.98
Dam 4, Ashland.....	3.98	5.75	4.30	4.59	2.34	3.21	1.24	2.74	4.59	1.13	3.38	4.01	41.26
Cordaville.....	3.86	6.03	4.47	4.95	2.73	2.53	1.74	3.35	4.91	1.25	3.50	4.21	43.53
Lake Cochituate.....	4.34	5.66	3.98	4.50	2.05	3.09	1.73	2.84	4.33	1.06	3.76	4.10	41.44
Chestnut Hill Reservoir.....	4.79	5.61	4.27	4.53	2.44	4.12	1.10	4.11	5.79	1.58	4.89	4.39	47.62
Spot Pond.....	4.04	5.31	3.80	4.23	1.96	4.27	2.27	3.53	5.12	1.28	4.31	3.95	44.07
Cambridge Observatory.....	4.62	5.22	3.90	3.90	2.01	3.82	1.62	3.19	5.54	1.12	3.99	4.92	43.85
Waltham, Boston Manufacturing Company.....	3.22	5.56	4.14	4.11	2.29	3.26	2.05	3.43	5.47	1.08	4.04		
Lowell, Locks and Canals Company.....	4.17	5.79	3.51	5.53	3.11	2.13	2.52	2.46	4.21	1.20	2.65	4.08	41.36
Main Drainage Yard, 795 Massachusetts avenue.....	4.58	4.99	3.79	4.21	2.23	3.78	0.86	3.41	5.67	1.18	2.72	3.60	41.02
Average of above ten places.....	4.17	5.57	4.02	4.51	2.35	3.31	1.68	3.19	5.02	1.20	3.65	4.13	42.79

GENERAL STATISTICS.

BOSTON WATER DEPARTMENT.

Daily average amount used during 1909 (gallons)	94,029,900
Daily average amount used through meters during 1909 (gallons)	22,768,700
Number of services February 1, 1910	97,194
Number of meters in service February 1, 1910	12,048
Number of motors under supervision February 1, 1910	117
Number of elevators under supervision February 1, 1910	583
Length of supply and distributing mains in miles, February 1, 1910	761.2
Number of public hydrants in use February 1, 1910	8,024
Yearly revenue from annual water rates (assessed)	\$1,411,156.63
Yearly revenue from metered water (assessed)	*\$1,285,477.63
Percentage of total revenue from metered water	47.7
Yearly expense of maintenance	\$654,493.49

* No revenue of any amount was received from the new meters set during the year 1909, all of the services metered during 1909 being assessed on the annual rate. The number of meters from which this revenue was derived was 5,500.

CIVIL ORGANIZATION OF THE WATERWORKS, FROM THEIR COMMENCEMENT TO FEBRUARY 1, 1910.

WATER COMMISSIONERS.

NATHAN HALE,* JAMES F. BALDWIN,* THOMAS B. CURTIS.* From May 4, 1846, to January 4, 1850.

ENGINEERS FOR CONSTRUCTION.

JOHN B. JERVIS, of New York, Consulting Engineer. From May, 1846, to November, 1848.*

E. S. CHESBROUGH, Chief Engineer of the Western Division. From May, 1846, to January 4, 1850.*

WILLIAM S. WHITWELL, Chief Engineer of the Eastern Division. From May, 1846, to January 4, 1850.*

ENGINEERS HAVING CHARGE OF THE WORKS.

E. S. CHESBROUGH, Engineer. From November 18, 1850, to October 1, 1855.*

GEORGE H. BAILEY, Assistant Engineer. From January 27, 1851, to July 19, 1852.*

H. S. MCKEAN, Assistant Engineer. From July 19, 1852, to October 1, 1855.*

JAMES SLADE, Engineer. From October 1, 1855, to April 1, 1863.*

N. HENRY CRAFTS, Assistant Engineer. From October 1, 1855, to April 1, 1863.

N. HENRY CRAFTS, City Engineer. From April 1, 1863, to November 25, 1872.

THOMAS W. DAVIS, Assistant Engineer. From April 1, 1863, to December 8, 1866.*

HENRY M. WIGHTMAN, Resident Engineer at Chestnut Hill Reservoir. From February 14, 1866, to November, 1870.*

A. FTELEY, Resident Engineer on construction of Sudbury river works. From May 10, 1873, to April 7, 1880.*

JOSEPH P. DAVIS, City Engineer. From November 25, 1872, to March 20, 1880.

HENRY M. WIGHTMAN, City Engineer. From April 5, 1880, to April 3, 1885.*

WILLIAM JACKSON, City Engineer. From April 21, 1885, to present time.

DESMOND FITZGERALD, Resident Engineer on additional supply. From February 20, 1889, to January 1, 1896.

After January 4, 1850, Messrs. E. S. CHESBROUGH, W. S. WHITWELL and J. AVERY RICHARDS were elected a water board, subject to the direction of a joint standing committee of the City Council, by an ordinance passed December 31, 1849, which was limited to keep in force one year; and in 1851 the Cochituate Water Board was established.

* Deceased.

COCHITUATE WATER BOARD.

Presidents of the Board.

THOMAS WETMORE, elected in 1851, and resigned April 7, 1856.†
 JOHN H. WILKINS, elected in 1856, and resigned June 5, 1860.†
 EBENEZER JOHNSON, elected in 1860, term expired April 3, 1865.†
 OTIS NORCROSS, elected in 1865, and resigned January 15, 1867.†
 JOHN H. THORNDIKE, elected in 1867, term expired April 6, 1868.†
 NATHANIEL J. BRADLEE, elected April 6, 1868, and resigned January 4, 1871.†
 CHARLES H. ALLEN, elected January 4, 1871, to May 4, 1873.†
 JOHN A. HAVEN, elected May 4, 1873, to December 17, 1874.†
 THOMAS GOGIN, elected December 17, 1874, and resigned May 31, 1875.†
 L. MILES STANDISH, elected August 5, 1875, to July 31, 1876.†

Members of the Board.

THOMAS WETMORE, 1851, 52, 53, 54 and 55.†
 JOHN H. WILKINS, 1851, 52, 53, *56, 57, 58 and 59.†
 HENRY B. ROGERS, 1851, 52, 53, *54 and 55.†
 JONATHAN PRESTON, 1851, 52, 53 and 56.†
 JAMES W. SEAVER, 1851.†
 SAMUEL A. ELIOT, 1851.†
 JOHN T. HEARD, 1851.†
 ADAM W. THAXTER, JR., 1852, 53, 54 and 55.†
 SAMPSON REED, 1852 and 53.†
 EZRA LINCOLN, 1852.†
 THOMAS SPRAGUE, 1853, 54 and 55.†
 SAMUEL HATCH, 1854, 55, 56, 57, 58 and 61.†
 CHARLES STODDARD, 1854, 55, 56 and 57.†
 WILLIAM WASHBURN, 1854 and 55.†
 TISDALE DRAKE, 1856, 57, 58 and 59.†
 THOMAS P. RICH, 1856, 57 and 58.†
 JOHN T. DINGLEY, 1856 and 59.†
 JOSEPH SMITH, 1856.†
 EBENEZER JOHNSON, 1857, 58, 59, 60, 61, 62, 63 and 64.†
 SAMUEL HALL, 1857, 58, 59, 60 and 61.†
 GEORGE P. FRENCH, 1859, 60, 61, 62 and 63.†
 EBENEZER ATKINS, 1859.†
 GEORGE DENNIE, 1860, 61, 62, 63, 64 and 65.†
 CLEMENT WILLIS, 1860.†
 G. E. PIERCE, 1860.†
 JABEZ FREDERICK, 1861, 62 and 63.†
 GEORGE HINMAN, 1862 and 63.
 JOHN F. PRAY, 1862.†
 J. C. J. BROWN, 1862.
 JONAS FITCH, 1864, 65 and 66.†
 OTIS NORCROSS, *1865 and 66.†
 JOHN H. THORNDIKE, 1864, 65, 66 and 67.†
 BENJAMIN F. STEVENS, 1866, 67 and 68.†
 WILLIAM S. HILLS, 1867.
 CHARLES R. TRAIN, 1868.†
 JOSEPH M. WIGHTMAN, 1868 and 69.†

* Mr. John H. Wilkins resigned November 15, 1855, and Charles Stoddard was elected to fill the vacancy. Mr. Henry B. Rogers resigned October 22, 1865. Mr. Wilkins was re-elected February, 1856, and chosen president of the Board, which office he held until his resignation, June 5, 1860, when Mr. Ebenezer Johnson was elected president, and July 2, Mr. L. Miles Standish was elected to fill the vacancy occasioned by the resignation of Mr. Wilkins. Otis Norcross resigned January 15, 1867, having been elected mayor of the city. Benjamin James served one year, in 1858, and was re-elected 1868. Alexander Wadsworth served six years, 1864-69, and was re-elected in 1872. Thomas Gogin resigned May 31, 1875. Charles E. Powers was elected July 15, to fill the vacancy occasioned by the resignation of Mr. Gogin.

†Deceased.

BENJAMIN JAMES,*1858, 68 and 69.†
 FRANCIS A. OSBORN, 1869.
 WALTER E. HAWES, 1870.†
 JOHN O. POOR, 1870.
 HOLLIS R. GRAY, 1870.
 NATHANIEL J. BRADLEE, 1863, 64, 65, 66, 67, 68, 69, 70 and 71.†
 GEORGE LEWIS, 1868, 69, 70 and 71.†
 SIDNEY SQUIRES, 1871.†
 CHARLES H. HERSEY, 1872.
 CHARLES H. ALLEN, 1869, 70, 71 and 72.†
 ALEXANDER WADSWORTH, *1864, 65, 66, 67, 68, 69 and 72.†
 CHARLES R. MCLEAN, 1867, 73 and 74.†
 EDWARD P. WILBUR, 1873 and 74.†
 JOHN A. HAVEN, 1870, 71, 72, 73 and 74.†
 THOMAS GOGIN, 1873, 74 and 75.*†
 AMOS L. NOYES, 1871, 72 and 75.
 WILLIAM G. THACHER, 1873, 74 and 75.†
 CHARLES J. PRESCOTT, 1875.†
 EDWARD A. WHITE, 1872, 73, 74, 75 and 76.†
 LEONARD R. CUTTER, 1871, 72, 73, 74, 75 and 76.††
 L. MILES STANDISH, 1860, 61, 63, 64, 65, 66, 67, 74, 75 and 76.††
 CHARLES E. POWERS, *1875 and 1876.††
 SOLOMON B. STEBBINS, 1876.†
 NAHUM M. MORRISON, 1876.††
 AUGUSTUS PARKER, 1876.††

*See note on preceding page.

†Served until the organization of the Boston Water Board.

††Deceased.

¹ BOSTON WATER BOARD.

ORGANIZED JULY 31, 1876.

*TIMOTHY T. SAWYER, from July 31, 1876, to May 5, 1879; and from May 1, 1882, to May 4, 1883.
 *LEONARD R. CUTTER, from July 31, 1876, to May 4, 1883.
 *ALBERT STANWOOD, from July 31, 1876, to May 7, 1883.
 *FRANCIS THOMPSON, from May 5, 1879, to May 1, 1882.
 WILLIAM A. SIMMONS, from May 7, 1883, to August 18, 1885.
 GEORGE M. HOBBS, from May 4, 1883, to May 4, 1885.
 JOHN G. BLAKE, from May 4, 1883, to August 18, 1885.
 *WILLIAM B. SMART, from May 4, 1885, to March 18, 1889.
 *HORACE T. ROCKWELL, from August 25, 1885, to April 25, 1888.²
 THOMAS F. DOHERTY, from August 26, 1885, to May 5, 1890; and from May 4, 1891, to July 1, 1895.
 ROBERT GRANT, from April 25, 1888, to July 17, 1893.³
 PHILIP J. DOHERTY, from March 18, 1889, to May 4, 1891.
 *JOHN W. LEIGHTON, from May 5, 1890, to July 1, 1895.
 WILLIAM S. McNARY, from August 15, 1893, to November 5, 1894.³
 CHARLES W. SMITH, from January 23, 1895, to July 1, 1895.

¹ Under chapter 449 of the Acts of 1895 the Boston Water Board was abolished, and the Water Supply and Water Income Departments consolidated and placed under the charge of one Water Commissioner.

*Deceased.

² Died in office.

³ Resigned.

¹ WATER COMMISSIONERS.

CHARLES W. SMITH, from July 1, 1895, to January 20, 1896.³
 JEREMIAH J. MCCARTHY (Acting), from January 20 to February 1, 1896.
 JOHN R. MURPHY, from February 1, 1896, to October 17, 1899.³
 BENJAMIN W. WELLS (Acting), from October 17, 1899, to December 28, 1899.
 *AUGUSTUS P. MARTIN, from December 28, 1899, to March 13, 1902.²
 JAMES DONOVAN (Acting), from March 14, 1902, to March 17, 1902.
 EUGENE S. SULLIVAN, from March 17, 1902, to January 11, 1906.³
 WILLIAM JACKSON (Acting), from January 11, 1906, to March 1, 1906.
 WILLIAM J. WELCH, from March 1, 1906, to April 27, 1908.³
 WILLIAM E. HANNAN, from April 27, 1908, to present time.

Assistant Water Commissioners.

JEREMIAH J. MCCARTHY, from July 1, 1895, to January 20, 1896.
 EDWARD C. ELLIS, from February 17, 1896, to November 1, 1900.
 *MELVIN P. FREEMAN, from February 7, 1900, to March 9, 1902.³
 WILLIAM H. OAKES, from November 1, 1900, to March 9, 1902.³
 EUGENE S. SULLIVAN, from March 10 to March 17, 1902.
 JOHN J. LEAHY, from March 21, 1902, to March 1, 1906.
 ISAAC ROSNOSKY, from March 10, 1902, to present time.
 JOSEPH J. NORTON, from March 1, 1906, to March 26, 1908.
 JAMES P. LENNON, from March 1, 1906, to March 26, 1908.

Chief Clerk of the Department.

WALTER E. SWAN.

General Superintendent Income Division.

JOSEPH H. CALDWELL.

Superintendent of Distribution Division.

GEORGE H. FINNERAN, from March 1, 1909, to present time.

City Engineer and Engineer of the Department.

WILLIAM JACKSON.

¹ See note on preceding page.

² Died in office.
 * Deceased.

³ Resigned.





No

